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THE PLANT DISEASE REPORTER

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U.S. DEPARTMENT OF AGRICULTURE

Division of Mycology and Disease Survey
BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
AGRICULTURAL RESEARCH ADMINISTRATION
UNITED STATES DEPARTMENT OF AGRICULTURE

Volume 36 Number 5

May 15, 1952

The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

THE PLANT DISEASE REPORTER

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THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station
Beltsville, Maryland

Volume 36
May 15, 1952
Number 5

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LEAF DISEASES OF CORN IN IOWA IN 1951

George Semeniuk and Edgar F. Vestal

Iowa's weather during the 1951 growing season (7) was abnormally cool and damp, as it was in 1950. Temperatures for the months of April to September, inclusive, were 2 to 9 degrees below normal (Table 1) and similar to the temperatures for the corresponding months in 1950 (24). Rainfall averaged 8 inches above normal (Table 2) and was greater than in 1950. Sixty-eight percent of the corn ears were well dented by September, 1951, compared with 63 percent by the same date in 1950. The percentages are lower than the 95 percent recorded in the more normal years of 1948 and 1949.

Table 1. Temperature departure from normal (oF) for the months of April to September, 1951.

Iowa Crop District	April	May	June	July	August	September
Ia	-8	-4	-5	-5	-4	-5
Ib	-9	-4	-5	-5	-5	-5
II	-9	-3	-4	-4	-4	-4
III	-8	-1	-3	-3	-3	-3
IVa	-7	-3	-4	-4	-4	-4
IVb	-8	-3	-4	-4	-4	-4
V	-7	-2	-3	-4	-3	-3
VI	-4	-2	-2	-2	-2	-2
VII	-7	-2	-4	-4	-3	-3
VIII	-8	-3	-4	-5	-4	-4
IX	-7	-2	-3	-4	-3	-3
State average	-7	-2	-3	-4	-3	-3

Table 2. Rainfall departure from normal (in inches) for the months of April to September, 1951.

Iowa Crop District	April	May	June	July	August	September
Ia	+0.7	+3.8	+5.6	+7.0	+8.7	+10.0
Ib	+1.4	+4.2	+6.3	+8.2	+10.7	+11.2
II	+2.6	+3.6	+6.6	+7.2	+8.9	+7.7
III	+2.7	+4.1	+4.5	+7.5	+9.1	+7.5
IVa	+1.6	+5.8	+7.0	+7.3	+10.4	+10.6
IVb	+2.3	+7.0	+9.9	+11.5	+16.0	+15.7
V	+1.9	+3.1	+3.7	+5.0	+6.4	+4.6
VI	+1.0	+3.5	+4.5	+5.8	+6.4	+5.0
VII	+1.7	+5.6	+7.4	+8.3	+10.0	+8.4
VIII	+1.5	+4.8	+7.0	+7.8	+9.1	+7.4
IX	+0.5	+1.9	+3.2	+5.0	+6.9	+4.5
State average	+1.6	+4.1	+5.6	+7.0	+8.8	+7.6

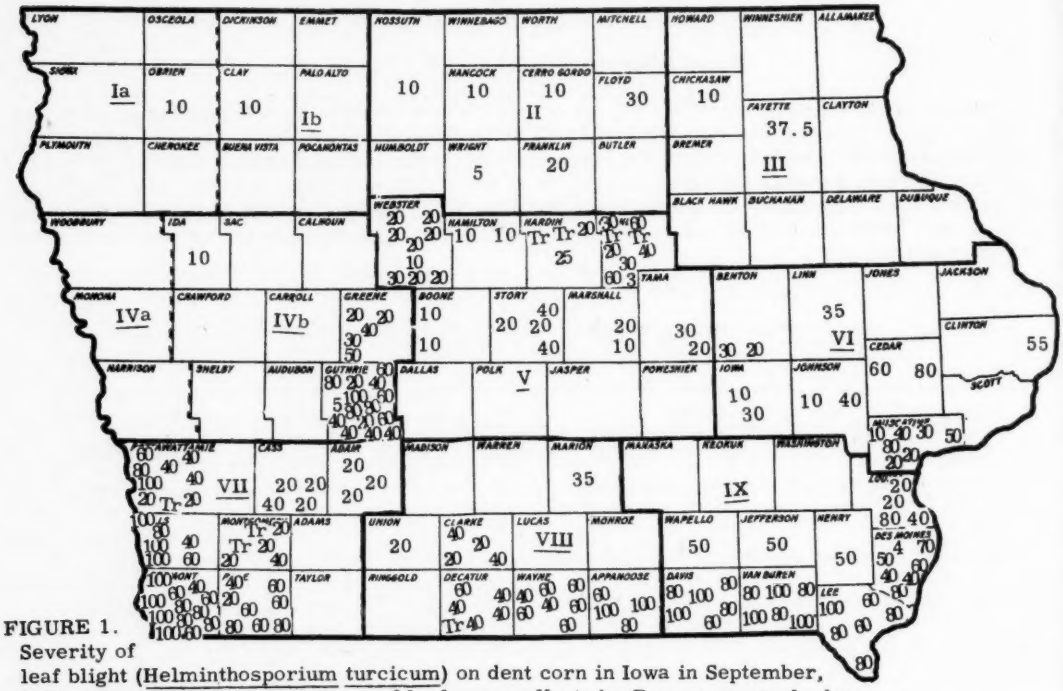

FIGURE 1. Severity of leaf blight (Helminthosporium turcicum) on dent corn in Iowa in September, 1951. Figures show percentages of leaf areas affected. Roman numerals designate crop districts.

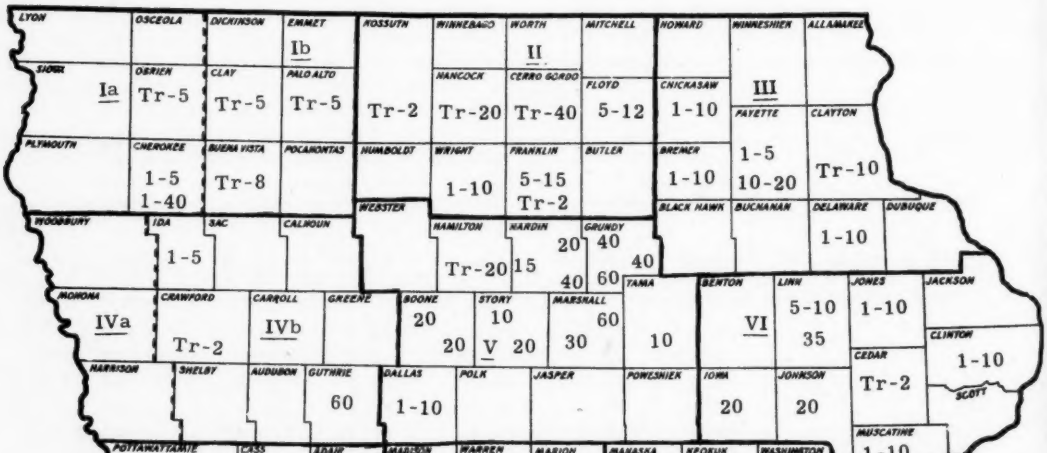

FIGURE 2. Severity of rust (Puccinia sorghi) on dent corn in Iowa in September, 1951. Figures show percentages of leaf areas affected. Roman numerals designate crop districts.

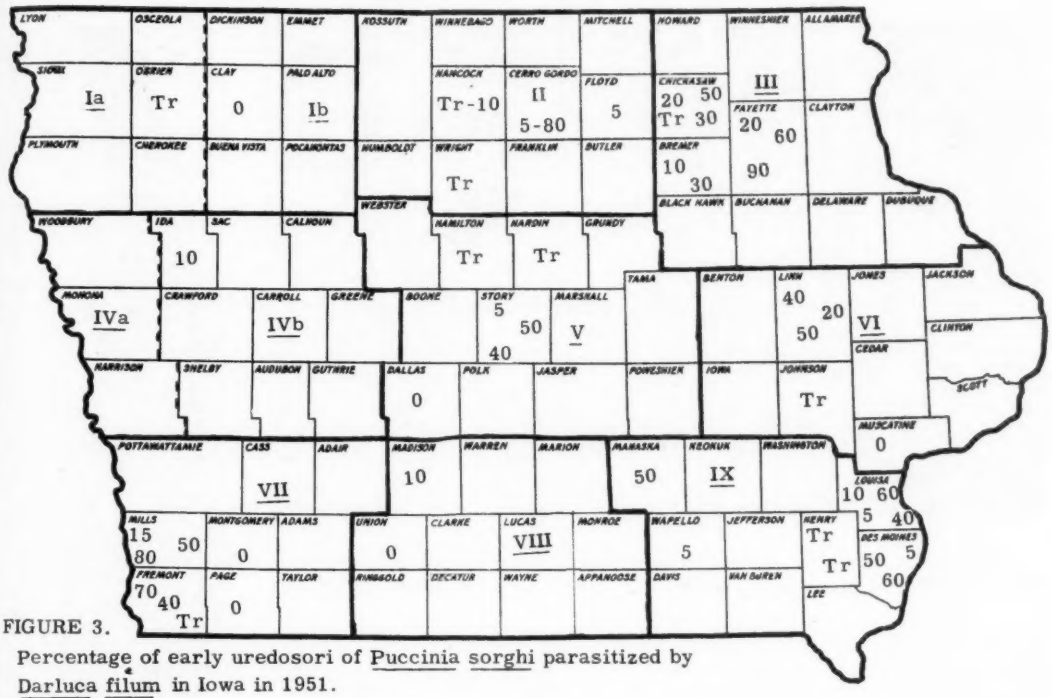

FIGURE 3. Percentage of early uredosori of Puccinia sorghi parasitized by Darluca filum in Iowa in 1951.

HELMINTHOSPORIUM TURCICUM LEAF BLIGHT: Helminthosporium turcicum leaf blight was generally more severe in 1951 than in 1950 (24). Trace to light amounts were present in the northwestern and northcentral parts, moderate amounts in the northeastern, and moderate to heavy amounts in other parts of the State (Figure 1). The disease was most severe in Lee, Van Buren, and Appanoose Counties in the southeast, in the southern parts of the southwestern counties Page and Fremont, in the Missouri River bottom south of Council Bluffs, and in the central part of the State. By mid-September all the leaves were killed in the severe blight areas in southeastern and southwestern Iowa, while only occasional fields were similarly blighted in central Iowa. Yield reductions were estimated at 30 to 40 percent in the severe blight areas and at 5 percent for the entire State.

CORN RUST: Corn rust caused by Puccinia sorghi was generally less severe in Iowa in 1951 than in 1950 (24), but it was more severe in the central part of the State than in 1950. Leaf infections on 67 farms in 51 counties in 1951 covered from a trace to 60 percent of the leaf surface compared to a trace to nearly 100 percent in 1950 (Figure 2). The average yield reduction was estimated at 1 percent, compared to 1.5 percent for 1950.

DARLUCA FILUM - A HYPERPARASITE OF CORN RUST: One probable reason why corn rust was less severe in 1951 than in 1950 was the presence of Darluca filum in the early formed uredosori (Figure 3). Puccinia sorghi appeared early in the growing season, but further spread of the pathogen was retarded from late July to early September. Examination of early formed uredosori during mid-September in 28 counties revealed from 0 to 90 percent of them parasitized by Darluca filum (Figure 4). Higher percentages of parasitized uredosori occurred in areas where corn rust was severe in 1950, suggesting that the abundance of Darluca filum increased during that year. This is the first record of the hyperparasite on corn rust in Iowa and apparently the first record of its probable importance in controlling corn rust epiphytotics in the United States. Dr. I. E. Melhus, Director of the Iowa State College-Guatemala Tropical Research Center, in Guatemala, stated in conversation that he believed Darluca filum definitely retarded spread of corn rust in Guatemala over a number of years.

Darluca filum has been recorded on at least 71 different species of rust in Lativa (11) and on a number of different rusts in the United States and Canada (1, 3, 6, 8, 9, 13, 22), but not hitherto on corn rust. Spegazzini (17) and Sydow (21) each described species of Eudarluca as the perfect stage of Darluca filum, and more recently, Keener (9) reported finding an ascomycete associated

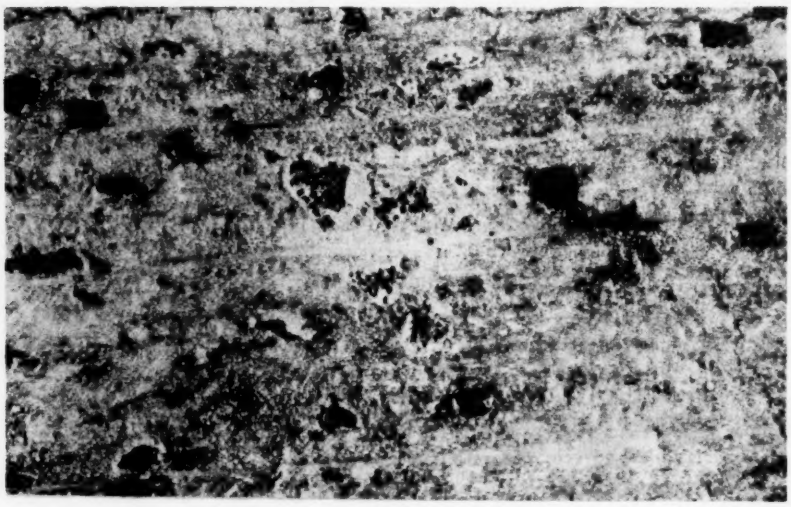

FIGURE 4. Section of a leaf, collected in Cerro Gordo County, Iowa, illustrating Darluca filum infection of the early-formed uredosori.

FIGURE 5. (right) A leaf spot frequently carrying pycnidia of Phoma.

with pycnidia of Darluca filum on Puccinia extensicola var. oenotherae on Carex sp., and on Puccinia obscura on Luzula sp., believing it to be the perfect stage of Darluca filum. An association of a similar ascomycete with pycnidia of Darluca filum in uredosori of Puccinia sorghi was observed in Guatemala by Dr. I. E. Melhus. Single ascospore cultures of the ascomycete proved identical with pycnospore cultures of Darluca filum, but since neither of the cultures formed ascospores, the connection between them was not established.

LEAF SPOT: A leaf spot similar to the Holcus bacterial spot described by Kendrick (10), but which frequently carried pycnidia of Phoma embedded in the tissues, was more abundant on field corn in Iowa during 1951 than it was in immediate past years. The spots were pale-centered and brown-bordered, of circular to oval outline, and varying in diameter from 2 mm. to as much as 10 mm. (Fig. 5). They were first noted in 1944 (15) and have been observed nearly every year since then. They developed primarily in the early part of the growing season when the plants were from a foot to several feet tall, and they ceased to develop after mid-July. Usually only the early-formed leaves were attacked but in some years, as in 1951, the spots appeared in fair abundance on all the lower leaves to as high as one or two leaves about the main ear. Certain hybrids and inbreds have been attacked more than others, but the differences have not been great. No yield reduction has been evident from the disease. The spots appeared similar to the spots associated with or ascribed to Phoma zeicola (4), Phyllosticta zeae (20), P. insidiosa (12) and perhaps P. sojaecola (2), while the fungus found in these spots produced chlamydospores or microsclerotia in culture, and pycnidia and pycnospores in culture and leaf tissue, that fit the specification of all these fungi where given. The fungus may be P. sorghina (18, 19). It is a common soil inhabitant, being frequently isolated from corn and onion roots, from sterilized clover and oat stems that were buried in the soil. It produced a leaf spot on young corn seedlings when leaves were injured with bristles of a bottle brush and the fungus spores were sprayed thereon (15).

STEWART'S WILT: Stewart's wilt caused by Bacterium stewartii and manifested as leaf streaks was observed in only two locations in Iowa; namely, in the experimental breeding plots at Ankeny and at Shenandoah. It was not observed in other parts of the State.

BROWN SPOT: Brown spot caused by Physoderma zea-maydis was found on single plants in each of two widely separated fields: a low-lying field of second year corn just east of Avoca in the southwestern part of the State, and a level field bordered on the east by tall trees 5 miles west of Spencer in the northwestern part. The disease was recorded only once before (5), when it was found in a field near Ames in 1928.

FIGURE 6. A low-lying portion of a corn field showing crazy top as indeterminate apical growths and phyllodous tassels.

FIGURE 7. Phyllody in Setaria viridis.

CRAZY TOP: Crazy top (Figure 6), manifested by phyllodous tassels, indeterminate apical growths and stunted plants, was fairly abundant in the central part of the State in 1951 as it was in 1945 (14, 16). It was most common in the lowest portion of fields and often affected as many as 50 percent of the plants. A similar condition was found on Setaria viridis (Figure 7) in one field one mile east of Kanawha in the northcentral part of the State. Oospores were not found in the leaf tissues of these plants as they were in corn in Indiana (23).

A NEW LEAF SPOT: An unknown leaf spot characterized by borderless, concentrically chlorotic and necrotic areas (Figure 8A) that began as small flecks and increased in size to coalesce with their neighbors (Figure 8B), was found on a Congo corn grown in experimental plots near Ankeny. About one-third of the plants of this corn were affected while corn in adjacent plots and in the surrounding area was unaffected. The spots began at the tips of the leaves in early July before the plants had tasseled, and spread rapidly downward to kill the leaves, stunt the plants, and prevent tasseling (Figure 8C). The disease apparently did not spread to adjacent plants. The spots also developed on the stalks below the nodes. Several kinds of

FIGURE 8. A new leaf spot disease of undetermined cause on a Congo corn.
A -- Early stage, note concentric chlorotic areas.
B -- Coalescing of spots causing death of leaves.
C -- Affected plant showing killed leaves.

bacteria and an Alternaria sp. were cultured from the necrotic tissues, but no attempt has been made to date to test their pathogenicities.

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DEPARTMENT OF BOTANY AND PLANT PATHOLOGY, IOWA STATE COLLEGE, AMES

TESTS OF NEWER SEED TREATMENTS - 1951[1]

J. E. Machacek[2]

Nine commercial and ten experimental fungicidal preparations were compared in uniform field tests at 22 stations in Canada and the United States. A summary is given here only for the commercial fungicides, as the experimental preparations may undergo modification before being offered to the public. Full details regarding formulation and experimental results for all fungicides tested were furnished to the co-operators in this project, while the manufacturers concerned received data only for their own products.

The commercial fungicides included in the 1951 tests were as follows:

1. Agrox -- a wettable dust containing 4.0% Hg as phenyl mercury urea. Distributed by Chipman Chemical Co., Boundbrook, New Jersey.
2. Agrox C -- a dust containing 2.5% Hg as a mixture of phenyl mercury acetate, ethyl mercury chloride, and mercury oxide. A wettable form of the same composition was tested under the name "Agrosan C". Distributed by Chipman Chemical Co., Winnipeg, Manitoba.
3. Bunt-no-more -- a dust containing 40.0% hexachlorobenzene. Distributed by Sherwin Williams Co., Montreal, Quebec.
4. Ceresan M -- a wettable dust containing 3.2% Hg as ethyl mercury p-toluene sulfonanilide. Distributed by E. I. Dupont de Nemours, Wilmington, Delaware, and Canadian Industries, Ltd., Montreal, Quebec.
5. Leytosol C -- a wettable dust containing 2.7% Hg as phenyl mercury urea. Distributed by Leytosan (Canada) Ltd., Winnipeg, Manitoba.
6. Mergamma -- a wettable dust containing 2.0% Hg as phenyl mercury urea and 40.0% gamma benzene hexachloride. Distributor as for Agrox.
7. Mergamma C -- a wettable dust containing 2.0% Hg as a mixture of phenyl mercury acetate and ethyl mercury chloride, plus 40.0% gamma benzene hexachloride. Distributor as for Agrox C.
8. Orthocide 406 -- a wettable dust containing 50.0% N-trichloromethylthiohydrophthalamide. Distributed by California Spray-chemical Corp., Richmond, California, and Elizabeth, New Jersey.
9. P.M.A.S. -- a water-miscible fluid containing 6.0% Hg as phenyl mercuric ammonium acetate. Distributed by Standard Chemical Co., Toronto, Ontario, and W. A. Cleary Corp., New Brunswick, New Jersey.

These fungicides were applied to the following kinds of seed:

(a) Red Bobs wheat artifically contaminated with mixed spores of Tilletia caries and T. foetida (1 part spores, by weight, to 200 parts seed).

(b) Vanguard oats naturally contaminated by Ustilago avenae and U. kolleri, with further spores of the two smuts added (1 part spores, by weight, to 400 parts seed).

(c) Sanalta barley naturally contaminated by U. hordei and U. nigra.

(d) Regent wheat in which about 75 percent of the kernels were naturally infected by Helminthosporium sativum.

(e) Royal flax in which about 50 percent of the seeds had been cracked during threshing.

In Table 1, the dosages shown for dusts are given in ounces per bushel and, for the fluid P.M.A.S., in fluid ounces per bushel. The slurries were applied at the rate of 2.3 cc. per pound of seed, the concentrations varying according to the weight per bushel of the seed but equivalent to the indicated weight of dry fungicide. In the case of the wet treatment (Leytosol C), the amount of dry fungicide shown was mixed with 20 ounces of water before being used as a treatment.

The seed used for these tests was treated in bulk and packaged at Winnipeg, the parcels of seed being sent to the co-operators in time for seeding at dates appropriate to their respective locations. The field data from the tests were analysed and a summary was prepared at Winnipeg.

The following co-operators assisted in the 1951 tests and their aid is here gratefully acknowledged: Ames, Iowa (C. S. Reddy and W. C. Haskett); Beaverlodge, Alberta (A. A. Guitard); Bozeman, Montana (E. R. Hehn and F. C. Petr); Brandon, Manitoba (W. H. Johnston); Brookings

[1]Contribution No. 1167 from the Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Canada.

[2]Sr. Plant Pathologist, Laboratory of Plant Pathology, Winnipeg, Manitoba.

Table 1. Summary of field data on effectiveness of certain newer fungicides used to control surface-borne smuts of wheat, oats, and barley, seedling blight of wheat, and seed rot of flax.

Treatments	Dose per bushel of seed		Percentage smutted heads			Percentage germination	
	Cereals	Flax	Red Bobs	Vanguard	Sanalta	Regent	Royal
No treatment	0.00	0.00	45.0	17.1	10.9	60.6	38.7
Ceresan M dust	0.50	1.50	0.1	Tr.[a]	4.3	80.4	49.7
Agrox dust	0.50	1.50	0.9	0.3	3.5	72.8	49.1
Agrox C dust	1.00	2.00	0.2	0.1	5.6	75.5	49.0
Bunt-no-more dust	0.50	0.50	0.3	10.2	10.6	65.1	36.7
Mergamma dust	1.66	5.00	0.4	0.6	1.6	66.0	45.7
Mergamma C dust	1.66	5.00	0.2	0.5	1.9	72.4	45.8
Orthocide 406 dust	0.50	0.50	13.0	2.2	4.0	71.2	50.3
Ceresan M slurry	0.50	1.50	0.2	Tr.	2.7	71.4	49.2
Agrox slurry	0.50	1.50	0.5	0.2	3.4	69.5	48.0
Agrosan C. slurry	1.00	2.00	0.1	0.3	3.7	68.3	48.2
Mergamma slurry	1.66	5.00	0.3	0.4	2.3	69.7	43.5
Mergamma C slurry	1.66	5.00	0.1	0.1	3.0	70.5	45.7
Leytosol C (wet)	0.50	1.50	0.8	2.2	6.9	71.1	49.3
P.M.A.S. fluid	0.25	0.75	0.4	1.1	3.2	71.8	51.1
" "	0.50	1.50	0.3	0.2	1.8	75.3	49.1
" "	0.75	2.25	0.2	0.1	1.4	72.0	49.2
Significant difference (5%)			1.1	2.0	2.0	3.6	7.2

[a] Tr. = Less than 0.1%

South Dakota (J. T. Slykhuis); Charlottetown, Prince Edward Island (G. W. Ayers and J. E. Campbell); Edmonton, Alberta (A. W. Henry and L. E. Tyner); Fargo, North Dakota (W. E. Brentzel); Fredericton, New Brunswick (J. L. Howatt); Geneva, New York (W. Crosier); Indian Head, Saskatchewan (H. McKenzie); Lacombe, Alberta (A. D. McFadden); Lethbridge, Alberta (M. N. Grant); Madison, Wisconsin (D. C. Arny); Melfort, Saskatchewan (H. R. Ballantyne); Morden, Manitoba (W. J. Breakey); Pullman, Washington (C. S. Holton); Saskatoon, Saskatchewan (R. C. Russell); Scott, Saskatchewan (A. G. Kusch); Ste. Anne de la Pocatiere, Quebec (R. O. Lachance); Swift Current, Saskatchewan (D. S. McBean); Winnipeg, Manitoba (H. A. H. Wallace).

DOMINION LABORATORY OF PLANT PATHOLOGY AT WINNIPEG, MANITOBA, CANADA

CONTROL OF LOOSE SMUT IN BARLEY BY TETRACHLORO-PARA-BENZOQUINONE (SPERGON-SL)[1]

L. E. Tyner and R. C. Russell[2]

The control of loose smut in Montcalm barley by treatment with Spergon was reported recently (1). In order to confirm these findings, further tests on the control of loose smut in several varieties of barley were undertaken at the Edmonton, Saskatoon, and Winnipeg laboratories of plant pathology in the spring of 1951.

The seed was first soaked in water for periods of 6 to 10 hours, then drained, and 0.2% Spergon-SL suspension added for an additional 40 to 50 hours. The seed was then drained, surface dried, and seeded in field plots. Data on the incidence of loose smut and on stand were secured approximately two months after planting. The data are shown in part in Table 1.

Table 1. Effect of Spergon-SL (tetrachloro-para-benzoquinone) on loose smut in barley.

Laboratory	Variety	Infection[a]	Water soak	0.2% Spergon soak	Loose smut
		%	hr.	hr.	%
Edmonton (Treatments at 72-75° F.)	Newal	5.9	10	48	0
	Montcalm	9.7	10	48	0
	Montcalm	9.3	10	48	0
	Newal	17.3	10	48	0
	Titan	16.1	10	48	0.6
	Plush	3.2	10	48	0
	Glacier	23.6	10	48	0[b]
Saskatoon (Treatments at about 72°F.)	Montcalm	12.1	6	48	0.1
	Newal	9.2	6	48	0.1
	Warrior	20.4	6	48	0
	Montcalm (frosted)	1.5	6	48	0[b]
Winnipeg (Treatments at 50-72°F.)	Newal	6.1	6	50	0.7
	Montcalm	10.1	6	50	0.05

[a] Infection determined on dry seed, treated with Ceresan.
[b] Stand seriously reduced.

At Edmonton, pre-soak periods of 6, 8, or 10 hours in water at room temperature (72°-75°F.) were employed, followed by 40, 44, or 48 hours in the Spergon suspension. Four 12-foot rows, totalling 800 seeds for each treatment, were planted and in mid-July the total number of healthy and smutted heads in each row were counted. The varieties used were Montcalm, Newal, Titan, Plush, and Glacier. Complete control of loose smut was obtained by several of the treatment schedules for all varieties except Titan. The 10-48 schedule afforded the most satisfactory control, and only the results from this treatment schedule are shown.

At the Saskatoon laboratory, a 6-hour pre-soak period was followed by 40, 44, or 48 hours in the Spergon suspension, and the treatments were made at room temperature. The most satisfactory control of loose smut was secured by the 6-48 schedule, and only the results from this

[1] Contribution No. 1166 from the Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Canada.

[2] Acknowledgement is made to Dr. J. E. Machacek, Dominion Laboratory of Plant Pathology, Winnipeg, Manitoba, for his cooperation in this experiment.

treatment are reported, which are based on approximately 1,500 heads for each variety.

At the Winnipeg laboratory, only two varieties, Montcalm and Newal, were treated, and these were pre-soaked in water for 6 hours, followed by 40, 45, or 50 hours in the Spergon suspension. The control of loose smut was unsatisfactory in the Newal variety. The average temperature at which treatments were carried out (50°-72°F.) at Winnipeg was considerably less than at the other two stations. This factor may have some effect on the results, since the rate of imbibition of water by barley increases as the temperature is increased.

Two samples, Glacier at Edmonton and Montcalm (frosted) at Saskatoon, suffered a serious reduction in stand. Susceptibility to damage is probably related to such factors as seed maturity, permeability, and effects of frost. It is possible that certain varieties may be more susceptible to injury than others, but little data are available on this point. Recently 100 seeds of each of 25 varieties grown in the National Barley Tests in 1951 were treated by the 10-48 schedule. Emergence in greenhouse plots averaged 68 percent and ranged from 35 to 93 percent. Only three varieties had less than 50 percent emergence.

Forty-eight hours in the Spergon suspension is recommended as the most satisfactory treatment and this can be preceded by 6, 8, or 10 hours pre-soak in water. Treatment should be in a heated room.

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DOMINION LABORATORIES OF PLANT PATHOLOGY AT EDMONTON, ALBERTA; SASKATOON, SASKATCHEWAN; AND WINNIPEG, MANITOBA.

THE GREENBUG, TOXOPTERA GRAMINUM ROND., A VECTOR OF THE CEREAL YELLOW-DWARF VIRUS

John W. Oswald and Byron R. Houston

In recent publications (1, 2) a new disease of cereals, called yellow-dwarf, has been described. This disease, which occurred in epiphytotic proportions in California in 1951, is characterized by a moderate to severe stunting in barley, wheat, and oats. Accompanying the stunting is leaf yellowing of barley, a brilliant red pigmentation of oats, and a chlorotic to light green discoloration of the new growth of wheat. Certain varieties of each of the three cereals exhibit a chlorotic longitudinal striping of the younger leaves. The areas over the veins remain green with the interveinal tissues becoming chlorotic to yellow.

Investigations to date have shown that the yellow-dwarf disease of cereals is caused by a virus and further that the four most important grain infesting aphids in California are all efficient vectors of this virus. The aphids shown to be vectors are: the apple-grain aphid, Rhopalosiphum prunifoliae (Fitch.); the corn aphid, Rhopalosiphum (Aphis) maidis (Fitch.); the English grain aphid, Macrosiphum granarium (Kirby); the grass aphid, Macrosiphum dirhodum (Walker). All attempts to transmit the virus mechanically have been unsuccessful.

Since the aphid known commonly as the greenbug, Toxoptera graminum, is of such extreme importance and widespread occurrence in many of the major cereal producing regions, it was considered important to determine if this aphid could act as a vector of the yellow-dwarf virus. Greenbugs have been reported in California on numerous occasions, being particularly common in the southern part of the State in the spring of the year. Since no colony could be located in California at the time of these tests, a culture of greenbugs was kindly furnished to the authors by the Division of Entomology at Kansas State College. During the course of these investigations this colony of greenbugs has been perpetuated by weekly transfers to healthy, caged Atlas 46 barley seedlings.

Two separate tests were conducted to ascertain if the greenbug could transmit yellow-dwarf. The barley variety Blackhulless (CI. 666) was used, since it has proved to be as susceptible as any cereal yet encountered. Within three weeks under greenhouse conditions the disease symptoms on this variety are very distinct, and dwarfing is so extreme that rarely does a plant infected in the seedling stage grow over six inches tall. Greenbugs were caged on infected Blackhulless plants and a large colony was allowed to build up. Then ten greenbugs were transferred to each 10-day old Blackhulless seedling with five seedlings grown in each six-inch pot. The aphids were caged for a three-day feeding period on the seedlings after which they were removed by parathion spray. Each experiment included 20 seedlings upon which no aphids fed, and 20 upon which greenbugs that had never been on yellow-dwarf plants were allowed to feed for the three-day period.

Table 1. Transmission studies of the cereal yellow-dwarf virus with the greenbug, Toxoptera graminum.

Aphid colony	Test No. 1: Number barley seedlings: Caged with aphids	Test No. 1: Number barley seedlings: Developing yellow-dwarf	Test No. 2: Number barley seedlings: Caged with aphids	Test No. 2: Number barley seedlings: Developing yellow-dwarf	Totals: Inoculated	Totals: Infected	Percent transmission
Greenbugs reared on yellow-dwarf plants	72	31	79	25	151	56	37.1
Greenbugs reared on healthy plants	20	0	20	0	40	0	0.0
Controls - (20 plants in each trial caged with no aphids)							0.0

The results in Table 1 clearly demonstrate that the greenbug can act as a vector of the yellow-dwarf virus. The 37 percent transmission obtained is somewhat higher than that found for the grass aphid, but considerably lower than that for the other three proven vectors.

It should be pointed out that in the three-day feeding period on barley seedlings both the infective and non-infective greenbugs caused direct feeding injury in the form of localized yellow spots with necrotic centers. In this short feeding period, however, no permanent damage was done and all but one or two plants showed no after-effect from the direct feeding injury of greenbugs. There was never any question about distinguishing greenbug feeding damage from the characteristic symptoms of the yellow-dwarf virus.

In view of the fact that the greenbug can act as a vector of this destructive yellow-dwarf disease it is perhaps important that a careful vigil should be kept on the possible occurrence of this disease in other cereal producing areas. There is at the present time a great similarity between the yellow-dwarf disease on oats and certain of the group of oat diseases referred to in the literature as "red-leaf."

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TWO STRAINS OF TOBACCO-MOSAIC VIRUS, ONE OF WHICH IS SEED-BORNE IN AN ETCH-IMMUNE PUNGENT PEPPER

H. H. McKinney[1]

INTRODUCTION

In 1945 John A. Martin called the author's attention to mosaic in his pungent-pepper improvement plats located on farms, and on the Experiment Station at Clemson and Florence, South Carolina. Since that time many collections of mottled leaves from pungent-pepper and pimento-pepper lines were received and tested at the Plant Industry Station, Beltsville, Maryland. A few mosaic collections also were received from W. H. Greenleaf, Georgia Experiment Station, Experiment, Georgia.

The virus of tobacco etch was one of the most common of the viruses isolated. The potato veinbanding-mosaic virus and the ringspot strain (3) of the potato X-virus were each isolated once. A virus resembling tobacco-mosaic virus, but causing mild signs in Samsun tobacco, was isolated on several occasions. The chlorotic pattern induced by this virus in Samsun tobacco is suggestive of the tobacco mild mosaic type 2 illustrated by E. M. Johnson (2, Pl. II, fig. 2). However, unlike Johnson's virus, this one has given no systemic infection in tomato. Another virus, also resembling that of tobacco mosaic, but latent in Samsun tobacco, was isolated once. In no case was the common coarse-mottling type virus of tobacco mosaic isolated from any of the pungent pepper materials tested.

The tests were conducted throughout the year in a greenhouse, unless stated otherwise. The temperatures were favorable for the culture of the plant species under study. The carborundum leaf-wiping method was used.

A PUNGENT PEPPER THAT IS IMMUNE FROM THE TOBACCO-ETCH VIRUS

Among the lines of pungent pepper supplied by John A. Martin, it was found that South Carolina line No. 46252 is immune from infection by the virus of tobacco etch collected from South Carolina and other States. Furthermore, when this pepper line was inoculated with the virus of tobacco mosaic or with the mild mosaic strain that is being described, only local necrotic lesions developed when the plants were cultured over a very wide range of temperatures. During hot summers in the greenhouse small systemic necrotic lesions appeared in the stems of a few plants, but this was rare.

To test this pepper under temperature conditions reasonably comparable to those obtaining during an unusually hot spring in the field, 20 young seedlings inoculated with the mild-mosaic virus, and five seedlings inoculated with the tobacco-mosaic virus, were cultured in a glass chamber located out of doors. The temperature in this chamber was regulated by a moving cam that was cut to give an undulating type of diurnal curve having a maximum near 92°F., at 2 P.M., and a minimum near 68°F., at 2 A.M. This curve was selected as it conformed reasonably well to the natural temperature curve at Florence, South Carolina during an exceptionally warm spring soon after pepper plants are set in the field. The test continued from January 13 to March 3, 1947. The intensity of the daylight was reduced only by double panes of window glass and the framework of the chamber.

All of the leaves that were wiped with virus developed local necrotic lesions and abscissed. There was no systemic necrosis and no mosaic mottling, such as obtains in certain other lines of pungent pepper (4) and certain species of Nicotiana (5), which expresses the necrotic factor when inoculated with the tobacco-mosaic virus and cultured at high temperatures.

A VIRUS THAT IS LATENT IN SAMSUN TOBACCO, AND SEED-BORNE IN THE ETCH-IMMUNE PUNGENT PEPPER

During the latter part of December 1949, mottled leaves from a pungent pepper plant grown at Florence, South Carolina, were extracted, and the extract was inoculated into Samsun tobacco and thence into several species of test plants. This extract yielded three viruses, i. e., tobacco-etch virus, potato veinbanding-mosaic virus, and a virus that is characteristically latent in Samsun tobacco.

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[1]Acknowledgement is due Mathew Koerner for valuable assistance in conducting the tests.

In the pungent pepper S. C. No. 46252, which is immune from the tobacco-etch virus, the "latent" virus induces strong light green mosaic mottling readily in all inoculated plants when cultured under the usual greenhouse conditions throughout the year. The mosaic mottling is very similar to the mosaic induced by the tobacco-etch virus or by the tobacco-mosaic virus in pepper lines carrying susceptibility factors for these mosaic reactions. The virus differs from Holmes' masked strain of tobacco-mosaic virus (1), as follows: In Nicotiana sylvestris Spegaz. & Comes, it induces local necrotic lesions, and is not systemic; in Rutgers tomato, it usually induces no local signs, it increases locally, but is not systemic; in Scotia beans, it induces no local or systemic infection.

In tests conducted during the autumn of 1950 and the winter of 1951, mosaic was observed in a few non-inoculated control plants of the etch-immune pungent pepper. Inoculation tests revealed the presence of the "latent" virus in each mosaic plant. At the outset, accidental infections were suspected, but the remoteness of the test from other plants (tobacco and pepper) infected with the latent virus, made this explanation seem unlikely, and strongly suggested that the infections came from seed collected from infected plants.

To test this idea, nine etch-immune pepper plants that had been inoculated with the latent virus, and had good mosaic symptoms, were kept under close observation. The seed was harvested from four plants on April 15, 1951, and kept in a warm to hot greenhouse for over three months. On July 21, 1951, the seed from the infected plants and seed from plants known to be free of virus were sown in pots in a greenhouse. The very small seedlings were transplanted individually to pots, and the pots were kept spaced to prevent the contact of the plants with each other. The plants from the seed of virus-free plants were interspersed among the other plants.

All of the 24 plants from the seed of the virus-free plants remained free of mosaic, but only one of the infected plants failed to yield some infected progeny. Table 1 shows that mosaic occurred in 19, or 21.6 percent, of the 88 plants from seed that was harvested from mosaic plants. Each of these mosaic plants was tested by appropriate methods, and found to contain the "latent" virus. Further tests are required to determine if the virus is carried with the seed internally or externally.

Table 1. Number of mosaic plants of pungent pepper, S. C. No. 46252, from seed harvested from plants infected with the latent strain of the tobacco-mosaic virus. Seeding date July 21, 1951.

Plant and pod nos.	Total no. of plants	Number of mosaic plants appearing on dates indicated							Total no. mosaic plants
		8/23	8/27	8/28	9/4	9/10	9/17	10/1	
Plant 1A									
Pod 1	9	1							1
Pod 2	11	1					1		2
Plant 3A									
Pod 1	8	1				1			2
Pod 2	13	2							2
Pod 3	11				1		1	1	3
Pod 4	8	1		1	2				4
Plant 3B									
Pod 1	11	1	1					1	3
Pod 2	8						2		2
Plant 5B									
Pod 1	9								0
Total	88								Total 19

Description of the Virus

Common Name: Latent strain of the tobacco-mosaic virus.

Transmission Characteristics: Readily by the carborundum leaf wiping methods in common use.

Host Reactions: In Nicotiana tabacum L., variety Samsun, the virus is systemic. Sometimes small local necrotic lesions and faintly chlorotic patches appear on the wiped leaves, but these signs have little diagnostic value as they are so similar to the signs of leaf senility. Systemic signs are exceedingly rare. In a few plants, one or two of the nearly mature leaves on a plant have shown rather large faintly light green patches between the lateral veins. Subsequent new leaves on these plants were free of signs though they contained virus. Attempts failed to isolate a virus that will induce these unusual patches consistently. Occasionally, faintly yellow spots suggesting mutation zones appear. In tobacco line 448A, no signs; there was local increase of virus, but no evidence of systemic infection. In Capsicum frutescens L., pungent pepper, etch-immune line S. C. No. 46252, strong mosaic mottling; virus borne in or on some of the seed from infected plants. In Lycopersicon esculentum Mill., and in Nicotiana glauca R. Grah., no signs; local increase of virus; no systemic virus could be recovered from tomato, but was recovered from N. glauca. In N. sylvestris Spegaz. & Comes, N. glutinosa L., and Datura stramonium L., local necrotic lesions, slower in development than lesions induced by the tobacco-mosaic virus; no systemic virus recovered from these species. In Phaseolus vulgaris L., no signs when inoculated plants were held at 33° to 34°C and below. In Cucumis sativus I ., no signs, but virus was recovered from the inoculated cotyledons in quantity.

Physical Properties: The virus from Samsun tobacco, when tested on Datura stramonium, has a dilution-end-point in distilled water beyond 10^{-8}; a thermal death point in 10 minutes between 85° and 90°C.; is highly active in dried Samsun tobacco leaves after storage for 18 months at room temperatures.

Distribution: In pungent pepper; Pee Dee Agricultural Experiment Station, Florence, South Carolina.

A VIRUS THAT INDUCES MILD MOSAIC IN SAMSUN TOBACCO AND IS LOCAL IN THE ETCH-IMMUNE PUNGENT PEPPER

Description of the Virus

Common Name: South Carolina mild mottling strain of the tobacco-mosaic virus.

Transmission Characteristics: Readily by the carborundum leaf-wiping methods in common use.

Host Reactions: In Nicotiana tabacum, variety Samsun, the virus is systemic, inducing in the first two to four leaves following inoculation, a mild, coarsely mottled pattern suggesting the pattern induced by the tobacco-mosaic virus. In the subsequent leaves, few to many mild light green diffuse spots develop, forming large light green areas when they coalesce. In this chronic stage, the pattern frequently suggests that of the mild mosaic type 2 illustrated by E. M. Johnson (2, Pl. II, fig. 2). Sometimes there is a slight amount of normal green veinbanding. The symptoms can be confused with those induced by some of the mild types of the potato veinbanding virus, and with the mild types of the tobacco etch virus in Samsun tobacco. Some of the collections of this virus have induced symptoms so mild and evanescent in Samsun that they may be regarded as latent. In tobacco line 448A, there are no signs; there is local increase of the virus, but no evidence of systemic invasion. In Capsicum frutescens, etch-immune line S. C. No. 46252, infection is local, rarely systemic necrotic lesions at high summer temperatures. In Lycopersicum esculentum, and in Nicotiana glauca, no signs; local, but no systemic virus reccvered from tomato, but systemic virus was recovered from N. glauca. In N. sylvestris, N. glutinosa, and Datura stramonium local necrotic lesions only, and very small in the latter species. In Phaseolus vulgaris, variety Scotia, the type culture of the virus induced no signs when the inoculated plants were cultured at 33° to 34°C., and below. However, some collections have induced very small necrotic lesions that can scarcely be detected. In Cucumis sativus, variety Early White Spine, sometimes local white specks; local increase of virus always in the wiped cotyledons. In Plantago lanceolata L., and P. rugelii Dcne., local lesions only.

Physical properties: The virus from Samsun tobacco, when tested on Datura stramonium, has a dilution-end-point in distilled water beyond 10^{-8}; a thermal death point in 10 minutes between 88° and 89°C.; is highly active in dried Samsun tobacco leaves after storage for 27 months at room temperatures.

Distribution: In pungent pepper, South Carolina and Georgia. Type collection from Agricultural Experiment Station, Clemson, South Carolina.

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PARASITIC AND NONPARASITIC DISEASES OF CELERY IN SOUTHERN CALIFORNIA

John T. Middleton, J. B. Kendrick, Jr., and Bernarr J. Hall

Celery is grown primarily as a fall and winter crop in the coastal region of southern California from San Luis Obispo to San Diego near the Mexican border. The mean annual rainfall in this region gradually diminishes from 21.9 inches at San Luis Obispo to 10.1 inches at San Diego. With variation in planting schedules the amount of rain upon the celery crop varies from approximately a 10-inch average at San Luis Obispo in the north to about an 8-inch average at San Diego in the south. The lowest minimum air temperature for this entire region varies from 20° to 28°F. The January average air temperature ranges from 51.2° to 55.1°F. Soil temperatures taken in celery fields at San Diego at a 6-inch depth range from a mean of 72° in September to 50° in January, with a minimum of 40°F. in January.

PARASITIC DISEASES

Parasitic diseases are the most common and account for the largest amount of crop losses.

Damping-off. Although damping-off of celery occasionally occurs it is not an important disease. Some seedling losses occur in low areas of seed beds, where water stands and drainage is poor. Fungi isolated from such infected plants are Pellicularia filamentosa (Pat.) Rogers, Pythium irregulare Buis., and P. ultimum Trow. Seed treatment for the control of seed-borne Cercospora apii Fres. and Septoria apii (Briosi & Cav.) Chester is not practiced, for most of the areas sown have been cropped continuously to celery so that the soils are heavily infested with these fungi. Failure to secure satisfactory stands of celery is usually attributable to inadequate water supply or soil salinity.

Root Rot. Root rot is uncommon throughout the entire coastal region. In the southern coastal region of California there are no records of the occurrence of Phoma root rot, incited by the fungus Phoma apiicola Kleb. Roots of the occasional dwarfed and chlorotic celery plants observed are either damaged in the process of transplanting or infected with one or more soil-inhabiting fungi such as Pellicularia filamentosa, Pythium irregulare, P. ultimum, and Sclerotinia sclerotiorum (Lib.) DBy.

Crown and Petiole Rot. Crown and petiole rots are somewhat more common than root rots, especially in areas with heavy clay soils. Diseases affecting crowns and petioles are crater rot, incited by Pellicularia filamentosa; soft rot, incited by Botrytis cinerea Pers.; and pink rot, incited by Sclerotinia sclerotiorum. Pink rot causes the greatest loss in mature plants and in field continually cropped to celery. Satisfactory control has been obtained by broadcast application of about 1000 pounds of cyanamid per acre to moist soil a minimum of 15 days prior to transplanting. The cyanamid should be incorporated in the top six inches of soil by either harrowing or discing. The application of cyanamid to celery strippings immediately after harvest does not control the disease in the subsequent celery crop unless the land is fallowed in the interim. Brooks (3) reports satisfactory control of pink rot by cyanamid applied either following a spring harvest or three to five weeks before fall planting. Selected results from several years' trials are presented in Table 1. Thirteen varieties of celery were grown in three areas near San Diego for the primary purpose of evaluating them for the incidence of certain nonparasitic diseases. Observations were also made upon the occurrence of pink rot in these variety trials. These observations are summarized in Tables 3, 4, and 5. The results secured indicate that there is no significant difference in varietal susceptibility to pink rot.

Vascular Wilt. Fusarium wilt, incited by Fusarium oxysporum f. apii (R. Nels. & Sherb) Snyder & Hansen, occurs in a very few locations and is of no economic importance. It occurs in fields cropped to susceptible golden and blanching types of celery and only rarely in areas cropped to resistant green types. Perhaps the principal limiting factor for the development of Fusarium wilt in fall and winter celery in California is the soil temperature. In addition to the inherent resistance of green types of celery to Fusarium wilt the disease is further restricted by the soil temperatures prevalent during the fall and winter seasons. When the disease does occur in green types it appears early, usually in August, September, and October. In November previously infected plants usually resume growth and soon appear to be healthy although the fungus may be isolated from infected tissue. Soil temperature records taken at a 6-inch depth in a celery field near San Diego over a four-year period provided the following data: mean monthly temperature for September was 72°; for October, 70°; for November, 57°; for December, 52°; for January, 50°; for February, 52°; and for March, 53°F. Nelson, Coons and Cochran (5) report that the optimum

Table 1. Soil application of cyanamid for the control of celery pink rot incited by Sclerotinia sclerotiorum.

Cyanamid lbs./ acre	Days elapsed from application to planting	Interim crop	Mean percent pink rot
1253	198	Corn	2.0
0			1.9
1181	191	None	0.7[a]
0			1.5
950	42	None	3.8[b]
0			14.2
961	25	None	1.9[b]
0			7.4

a Significantly different from no treatment at the 5 percent level.

b Significantly different from no treatment at the 1 percent level.

soil temperature for development of Fusarium wilt is 82.4°F., and that the disease failed to develop at 64.4°F. Since the soil temperatures in September and October favor the development of Fusarium wilt and those in November onward do not, the disappearance of the disease and the recovery of the plants may not be attributed to the reduction of the soil temperature.

Verticillium wilt, induced by Verticillium albo-atrum Reinke & Berth., has not been observed in southern California. The fungus has, however, been isolated from discolored vascular bundles of stems and petioles from plants which showed no visible wilt or stunt.

Viroses

Viroses of celery occur throughout the coastal region. The most common and damaging virosis is western celery mosaic. The leaves of affected plants are yellowed, mottled, or crinkled; the young petioles are shortened; and the outer petioles are decumbent and no longer upright, the entire plant appearing somewhat flattened. Celery is sometimes affected with calico, a disease in which the veins are usually cleared or yellowed, or the basal area of the leaflets yellowed and the leaves savoyed and cupped. A mottle, crinkle, and filiformy of celery is sometimes observed to occur as a result of infection by one or more strains of the common cucumber-mosaic virus. Celery yellows, incited by the aster-yellows virus, is found in all celery-growing districts but rarely causes any significant loss. A discussion of these and several other viroses is presented by Severin and Freitag (7) and Freitag and Severin (4).

Foliage Blight. Foliage blights are the common and damaging diseases of celery in this southern region. Septoria blight (Septoria apii) is the most important and widespread disease occurring on fall and winter celery. Control is effected in the early part of the season prior to the rainy season by copper and zineb dusts. These dusts are usually ineffective with the advent of rain, but control can be secured through use of the same fungicides applied as sprays. Zineb is somewhat less effective than copper in periods of high rainfall-high fungus populations. The effect of adding an adjuvant to bordeaux for the control of Septoria blight is presented in Table 2.

Cercospora blight (Cercospora apii) occasionally occurs early in the growing season on fall celery, but it is of little importance and usually disappears with lower air temperatures and increased rainfall.

NONPARASITIC DISEASES

A number of nonparasitic diseases are known to occur on celery grown in southern California. Perhaps the three most common diseases are blackheart, crack stem, and bud failure.

Blackheart. Blackheart occurs sporadically throughout the coastal celery growing region but generally causes a limited economic loss. The disease appears most commonly in fields receiving irregular water supply or on land that is not suitably levelled or that is saline. Blackheart losses are sometimes aggravated by heavy rainfall following normal irrigation, especially in poorly drained saline soils. The diseased tissue of blackheart-affected plants is very often attacked by Botrytis cinerea and Sclerotinia sclerotiorum, which cause a watery soft rot and ultimate collapse of the entire plant. Varietal response to blackheart could not be assessed as the disease failed to develop in any of the variety trial plots.

Crack Stem. Crack stem of celery, due to boron deficiency, was first observed in California

Table 2. The effect of adjuvants upon the efficacy of bordeaux for the control of Septoria apii on Pascal celery.

Concentration	Adjuvant		Percent control
6-6-100	None		85.2[a]
3-3-100	None		45.1
3-3-100	Blood albumin	1/4 lb.	87.3[a]
3-3-100	Casein	1/4 lb.	73.9[a]
3-3-100	Du Pont spreader sticker	4 oz.	92.4[a, b]
3-3-100	Triton 1956	8 oz.	38.2
3-3-100	IN 181 P	1/8 lb.	41.5

[a] Significantly different than 3-3-100 with no added adjuvant at the 1 percent level.
[b] Significantly different than 6-6-100 at the 5 percent level.

by Bardin in the Salinas Valley in the fall of 1945 (1). Subsequently the disease has been observed in other parts of the State, including all of the principal celery growing areas of southern California. As pointed out by Bardin (1, 2) it is of interest to note that a brown discoloration, corking, and transverse checking of the adaxial part of the petiole usually accompanies the abaxial boron deficiency symptom but is by no means always associated with it. Whether the adaxial condition, sometimes referred to as brown checking, is related to the abaxial one and is likewise caused by boron deficiency has not been conclusively demonstrated.

The recent occurrence of adaxial crack stem in California celery in areas which have heretofore produced crops free from crack stem has been attributed to a variety of conditions, ranging from the low rainfall cycle to the general usage of the variety Utah 10B following its introduction in 1943. Adaxial crack stem is most common in fields which have received extraordinary amounts of nitrogenous fertilizers, both inorganic and organic. Several fields have been observed in which both Utah 16 and 10B have been planted, and when adaxial crack stem has been present the disease has been more prevalent and more damaging on 10B than on 16, indicating a difference in varietal susceptibility. As a result of these observations three varietal trial plots were established in the vicinity of San Diego for the purpose of determining varietal susceptibility to adaxial crack stem, as well as to several other diseases. All varieties were grown in randomized replicated blocks consisting of two adjacent plant beds 30 feet long and spaced 32 inches apart. Unfortunately, no crack stem appeared in any of the plots, but since the data provided information for other diseases the material has been summarized in Tables 3, 4, and 5.

A sequence of symptoms typifies the symptom complex of adaxial crack stem. The symptoms first appear on the immature, incompletely green, imbricated petioles in the developing apical bud of the plant. The distal, adaxial surface of the petiole is watersoaked in the central portion, presenting a vertically elongated pattern about 2 to 5 mm. long and 1 to 2 mm. wide with an irregular, wavy margin. As the petiole elongates the affected area increases in length, turns yellow-brown, but remains fairly narrow. Subsequently, some of the tissue becomes necrotic and the margins appear etched and dark brown or black. Transverse checks and cracks appear as the petiole continues to elongate, and the affected area becomes corky. Lesions on fully elongated petioles may vary in length from 2 to 20 cm. and in width from 5 to 20 mm. Occasionally similar but smaller lesions may appear on the petiolules.

Severely diseased petioles are deeply cupped and their margins may touch one another or be separated by only a few millimeters. Occasionally the tissue above and adjacent to the vascular bundles is etched and corky. The symptoms described are not found on the abaxial portion of the petiole. Plants affected with adaxial crack stem are not usually stunted and have normal petiole pith and laminas, and in this respect differ from celery plants affected by abaxial crack stem induced by boron deficiency as reported by Purvis and Ruprecht (6).

The similarity of the adaxial petiole symptom in celery to that induced by boron deficiency in sugar and garden beets, cabbage, cauliflower, and Swiss chard suggests that the symptom in celery may also be induced by boron deficiency, although not previously described. At Oceanside, north of San Diego, adaxial crack stem caused considerable crop loss in one field and no loss in an adjacent field of the same variety on the same soil type where the plants were sprayed twice with

Table 3. Summary of results secured from celery variety trials conducted at Oceanside, California, 1950-1951. Celery was sown May 11, transplanted to the field August 25, 1950, and harvested January 4, 1951.

Variety	Seed source and no.	No. crates per acre	Percent			
			Bud failure	Hearts	Split petiole	Pink rot
Summer Pascal	F-M 8452	1008	1.0	47.3	12.7	5.8
Taller Utah	Wood. BG1-0449	1123	1.2	24.6	0.6	3.6
Utah 10B	F-M 8449	986	0	39.2	3.8	3.4
Utah 16	Asgr. 57100	962	4.9	25.6	0.6	8.4
Utah 16	Asgr. PC485708	948	2.3	33.8	3.5	8.2
Utah 16	Asgr. PC485706	723	13.4	33.5	3.3	11.7
Utah 16	Asgr. PC485707	909	1.0	21.5	0.9	12.3
Utah 16	Asgr. PC463068	1088	2.6	31.7	0.4	8.8
Utah 218	Asgr. PC472400	1054	3.1	27.1	3.4	5.2
Least Significant Difference (19:1)		148	4.9	n.s.	6.8	n.s.
Least Significant Difference (99:1)		200	6.4	n.s.	n.s.	n.s.

Table 4. Summary of results secured from celery variety trials conducted at Chula Vista, California, 1950. Celery was sown May 22, transplanted to the field August 29, and harvested December 29, 1950.

Variety	Seed source and no.	No. crates per acre	Percent			
			Bud failure	Hearts	Split petiole	Pink rot
New Summer Pascal	F-M	814	0	37.5	34.3[a]	6.7
Summer Pascal	F-M 8452	1081	1.1	27.8	10.3[a]	17.0
Taller Utah	Wood. BG1-0449	1317	0.3	25.6	0	14.9
Utah	F-M 7298	1217	2.9	27.8	0	19.7
Utah 9	Wood. BG1-0450	1115	1.6	27.8	0	12.2
Utah 10B	F-M 8449	1212	0.3	30.4	0	13.7
Utah 15	F-M 8450	1065	5.6	21.3	0	14.9
Utah 16	Asgr. 57100	1357	1.1	22.3	0	20.2
Utah 16	Asgr. PC463068	1372	0	24.4	0	22.6
Utah 218	Asgr. PC472400	1365	2.4	26.0	0	11.6
Least Significant Difference (19:1)		104	n.s.	n.s.		n.s.
Least Significant Difference (99:1)		142	n.s.	n.s.		n.s.

[a] Significantly different than all other varieties and between themselves.

borax at the rate of 10 pounds per acre. Applications of borax to most California soils have usually failed to prevent the occurrence of this disease. A number of controlled micronutrient spray tests including boron as well as copper, iron, magnesium, manganese, and zinc have been initiated. A report of this work will be given after this year's trials are completed.

Table 5. Summary of results secured from celery variety trials conducted at Chula Vista, California, 1950-1951. Celery was sown June 9, transplanted to the field September 19, 1950, and harvested January 30, 1951.

Variety	Seed source and no.	No. crates per acre	Percent			
			Bud failure	Hearts	Split petiole	Pink rot
New Summer Pascal	F-M	891	5.9	17.0	28.2[a]	2.3
Summer Pascal	F-M 8452	1173	2.8	22.4	8.5[a]	4.6
Taller Utah	Wood. BG1-0449	1410	8.4	12.6	0	8.1
Utah	F-M 7298	1297	19.8	6.6	0	9.2
Utah 9	Wood. BG1-0450	1316	9.2	8.4	0	3.6
Utah 10B	F-M 8449	1359	20.6	6.7	0	6.4
Utah 15	F-M 8450	1126	33.9	4.7	0	0.3
Utah 16	Asgr. 57100	1428	14.5	12.2	0	4.3
Utah 16	Asgr. PC463068	1302	13.5	11.2	0	5.5
Utah 218	Asgr. PC472400	1351	6.6	12.6	0	1.7
Least Significant Difference (19:1)		156	n.s.	7.0		n.s.
Least Significant Difference (99:1)		212	n.s.	9.7		n.s.

[a]Significantly different than all other varieties but not different in themselves.

Bud Failure. Bud failure is a nonparasitic disease in which the apical bud of the celery plant fails to develop, either producing a "blind" or "baldhead" plant, or producing a multiple shoot plant. This latter condition is sometimes referred to as "split heart" or "double". Bardin first believed that bud failure was related to boron deficiency, but later reported no bud failure in a celery plantation in which 40 percent of the plants showed abaxial, or typical, boron deficiency symptoms.

The percentages of bud failure in the three varietal trials conducted in the vicinity of San Diego are given in Tables 3, 4, and 5. All the varieties tested showed some bud failure, but only one accession of Utah 16 produced significantly higher numbers of bud failures. Since these bud failures were produced in plantings in the absence of crack stem symptoms, it must be concluded that bud failure may operate independently of boron deficiency; further, that celery lines contain genetic propensities for production of bud failure, and that seasonal or cultural factors may affect the development of this disease.

Oiling of celery seed beds for weed control has been thought by some growers to be responsible for production of bud failures. One trial was conducted at Chula Vista in which the plants in one row of two for each variety were taken from seed beds treated with oil for weed control, and the other row from non-oil treated seed beds. The experimental design was otherwise identical to that for the data reported in Tables 3, 4, and 5. The percentage bud failure for oiled and non-oiled plants is given in Table 6. The analysis of variance shows no significant differences in percentage bud failure either between varieties or treatments.

Split Petiole. Celery sizes are sometimes reduced by reason of a split at the base of the outer petioles, requiring their removal before packing. Split petiole bases apparently arise as a result of an increase in the diameter of the base of the celery stalk without an increase in the size of the base of the outer attached petioles. Although split petioles occur in a number of celery varieties, they are most common in the Summer Pascal types. The data given in Tables 3, 4, and 5 show that New Summer Pascal and Summer Pascal varieties produce more split petioles than all other varieties, but that the differences between them are statistically significant only in the early planting. Since split petioles do not appear in summer-planted Summer Pascal varieties, it would appear that the development of this abnormality is the result of planting these types in seasons not suitable for their normal development.

Variety Yields. In addition to the varietal response to the several diseases discussed, it is of

Table 6. The effect of seed bed oiling for weed control upon the incidence of celery bud failure, Chula Vista, California. Oiled July 7, 1950; harvested January 30, 1951.

Variety	Percent bud failure	
	Non-oiled	Oiled
New Summer Pascal	5.6	6.2
Summer Pascal	1.7	4.0
Taller Utah	7.2	9.7
Utah	20.7	18.9
Utah 9	9.5	8.9
Utah 10B	19.8	21.5
Utah 15	33.7	34.1
Utah 16	15.2	13.8
Utah 16	10.5	10.5
Utah 218	6.3	6.9

interest to note that some varieties produce significantly greater yields than others. A comparison of the data given in Tables 3, 4, and 5 discloses that under fall-winter growing conditions in the vicinity of San Diego the greatest yields per acre were made by Taller Utah, Utah 16 (Asgrow PC463068), and Utah 218. These were followed by Utah 10B, and Utah 16 (Asgrow 57100). Summer Pascal was a good producer when planted early in the season, while Utah and Utah 9 were good producers when grown late in the season. There is no significant difference between varieties for the percent hearts, or sizes 3 1/2 dozen or smaller, produced.

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MACROPHOMINA STEM CANKER AND ASHY STEM BLIGHT OF COWPEA[1]

E. S. Luttrell and J. L. Weimer[2]

In 1945 Weimer and Luttrell (3) described a leaf spot of cowpea caused by Macrophomina phaseoli (Maubl.) Ashby. This disease was found in a planting of cowpeas at the Georgia Experiment Station after a period of rainy weather in September 1944. The diseased leaves dropped off, and the infection did not spread to other leaves or into the stems. Several weeks later no traces of the disease were evident. However, at Arabi, Georgia, on August 29, 1944, and at the Georgia Experiment Station on September 13, 1946, more extensive outbreaks of Macrophomina leaf spot were observed in which the fungus spread from the infected leaves into the stems and caused a serious stem canker and blight of the plants.

The leaves exhibited the symptoms of Macrophomina leaf spot described previously (3), but in these plantings entire leaves were killed and covered with pycnidia (Fig. 1). The first symptom of stem infection was a small, chocolate brown, irregular lesion on the side of the stem. These lesions usually appeared at a node. Often a dead petiole covered with pycnidia was still attached in the center of the lesion, and it seemed probable that the fungus usually entered the stem from infected petioles (Fig. 2). The lesions enlarged to form elongated cankers with tan to finally gray centers and wide chestnut to chocolate brown borders. The surface of the canker was slightly sunken and ultimately became split and frayed. Pycnidia were produced abundantly in the dead tissue. The cankers soon girdled the smaller stems, and the distal portions died. The fungus spread down the smaller branches and entered the main stem in the same manner as it spread into the branches from the petioles. On the larger stems very long cankers were produced before death resulted. The dead stems showed typical symptoms of ashy stem blight, being pale gray and dotted with the numerous black pycnidia of the fungus. The dead pods were likewise covered with pycnidia, and the seed inside were infected to varying degrees.

The seedling phase of this disease, which is commonly called charcoal rot, has been described by Tompkins and Gardner (2). Charcoal rot occurs on seedlings which become infected during emergence, usually through the cotyledons, by mycelium in the soil. Macrophomina stem canker and ashy stem blight result from secondary infection, presumably by air-borne conidia or sclerotia. There was no evidence of infection of the base of the stem from the soil. The disease appeared first on the aerial parts, and the plants died back from the tops. Andrus (1) has reported similar observations on M. phaseoli on lima bean. He found that infection of lima bean occurs in two distinct phases: primary infection of seedlings from the soil during emergence, resulting in charcoal rot, and secondary infection of the shoots of older plants by air-borne conidia, resulting in ashy stem blight.

In the planting at Arabi there was almost 100 percent infection toward the end of August when it was first observed. The plants were largely defoliated, and the stems were cankered and blighted. All but a few pods were mature and dry, and many were infected. Green peas had been harvested from this planting, and the disease probably occurred too late in the season to cause any considerable damage to the crop.

The outbreak of this disease observed at the Georgia Experiment Station in September 1946 occurred in a cowpea variety test and afforded an opportunity to determine differences in varietal susceptibility to ashy stem blight. Estimates of percentage of infection indicated that the following varieties were highly resistant: Six Weeks Ala, Speckled Crowder, Brabham, Cream Crowder Short Pod, Groit, Alalong Browneye, Victor, and Sugar Crowder. Highly susceptible varieties were Early Ramshorn Blackeye, California Blackeye, Whippoorwill, Early Dixie Queen, and Alabunch. However, degree of infection appeared to be correlated with maturity date. The varieties classed as susceptible were early varieties which produced mature dry pods in 50 to 67 days. Those classed as resistant were late varieties which took 60 to 95 days to produce mature dry pods Consequently, it seems probable that the varieties which appeared to be resistant merely escaped infection because they had not yet become senescent at the time when conditions were favorable for the development of the disease.

Macrophomina stem canker and ashy stem blight have not been observed on cowpea in subsequent years, although no special surveys have been made. It probably is a disease of minor importance, chiefly affecting senescent plants after the crop is harvested and being dependent on periods of humid weather when the plants are at the proper stage of maturity.

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[1]Paper No. 221, Journal Series, Georgia Experiment Station

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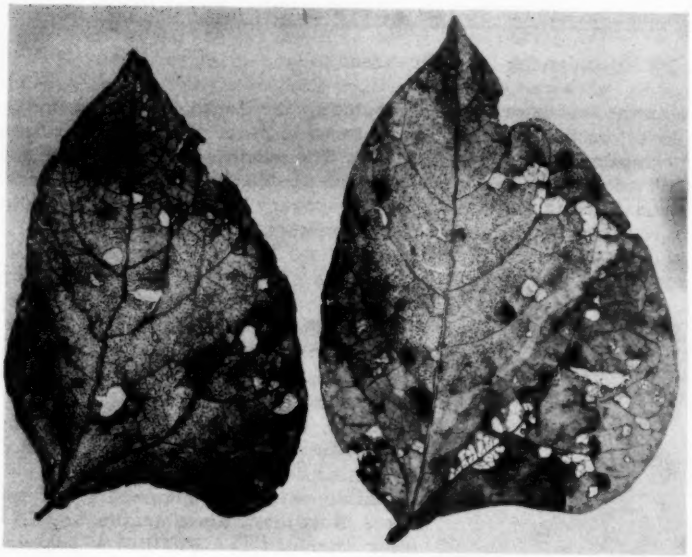

FIGURE 1. Leaflets of cowpea infected with Macrophomina leaf spot.

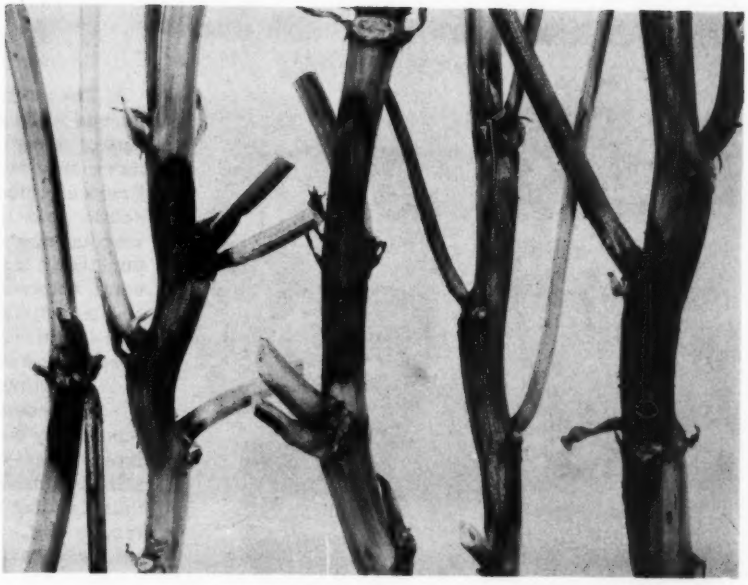

FIGURE 2. Stems of cowpea showing various stages of infection with Macrophomina stem canker.

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AN OCCURRENCE OF A GUMMOSIS OF SUGAR BEETS IN ONTARIO IN 1951[1]

L. W. Koch and A. A. Hildebrand[2]

On December 8, 1951, the Harrow laboratory was requested by the Canada and Dominion Sugar Company to investigate a condition that had been encountered in certain lots of sugar beets assembled in the company's storage piles at Chatham (Fig. 1). The condition of these beets was such as to interfere seriously with the normal processing operations, the filters having become so clogged with a mucilaginous exudate as to necessitate two temporary but expensive shut-downs of the big refinery.

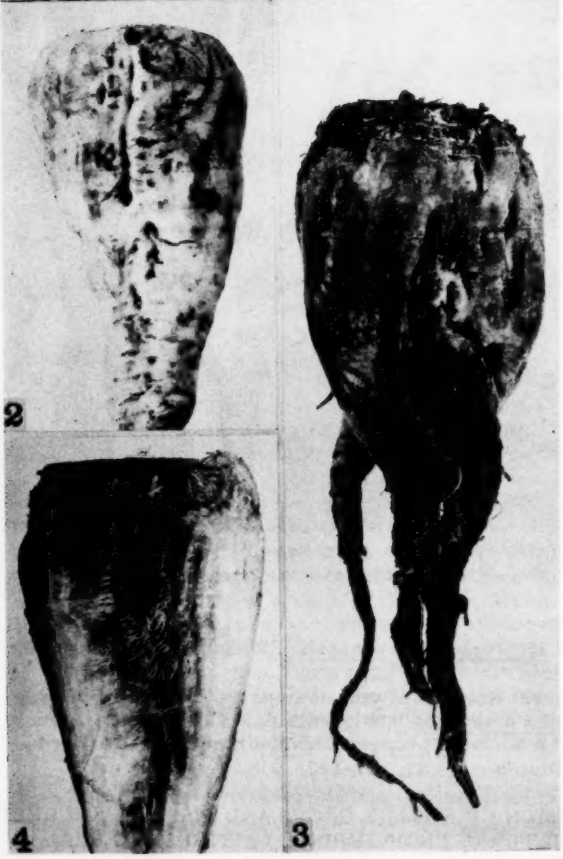

FIGURE 1. Gummosis-affected sugar beets segregated as being entirely unfit for processing. (By courtesy of Canada and Dominion Sugar Co. Ltd., Chatham, Ontario). FIGURE 2. Healthy sugar beet obtained from storage pile December 14, 1951. FIGURE 3. External appearance of gummosis-affected beet. Note black discoloration and disintegration of tips. FIGURE 4. Internal appearance of gummosis-affected beet.

The particular beets concerned were observed to be almost black in colour and the tips of many of them had already undergone more or less serious disintegration (Fig. 4). From affected beets emanated a strong acetic-acid-like odour. Globules of a frothy, viscous exudate had erupted through the beet surface in many places. Freshly-sectioned beets showed brownish discolored tissues and lacuna-like cavities (Fig. 3) which soon filled with a clear, viscous fluid. The latter spreading over the exposed beet surface gave to it a distinctly vitreous appearance.

The condition was reproduced in the laboratory when drops of the viscous fluid from affected beets were transferred to slices of healthy beets that had been thawed quickly after being frozen solidly in a deep-freeze unit. The same liquid transferred to slices of healthy, non-frozen beets had no appreciable effect. The condition is undoubtedly identical with that recently described by Simon[3] in Belgium and is due to the action of

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[2] Officer-in-Charge, and Senior Plant Pathologist, respectively.

[3] Simon, M. L'etude de la conservation de la betterave depuis l'arrachage jusqu'a la fabrication. Publications de L'Institut Belge pour L'Amelioration de la Betterave. No. 2, pp. 21-55, Mars-Avril, 1951.

certain bacteria on beets that through lack of care in handling have been allowed to freeze and thaw between harvesting and final delivery to the factory.

In 1943, Savulescu[4] described a bacterial gummosis of sugar beets which over the years caused serious losses in the Danubian plains of Rumania. In certain respects the symptoms of bacterial gummosis resemble closely those described above for the condition encountered this year in Ontario for the first time. In Rumania, however, the condition develops in the field during the summer before there is any chance of injury by freezing. Lack of boron is claimed to be the principal factor predisposing beets to attack by Bacillus betae and possibly other microorganisms.

In Ontario, boron deficiency is attracting more and more attention each year and, during the last season, the effects of the lack of this element were more widely evident than usual. When the storage piles were being examined in connection with the present limited investigation, a surprising number of beets affected with heart rot were noted. While, at the moment, there is no basis for claiming a correlation between boron deficiency and the incidence of the type of gummosis observed, nevertheless, the possibility of such a correlation should not be entirely discounted.

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[4]Savulescu, T. La gommose bacillaire de la betterave a sucre. Internat. Bull. Plt. Prot. 17(3): 34-39. 1943.

RELATION OF WOUNDS TO THE FRUIT ROT PHASE OF THE BROWN ROT DISEASE OF PEACHES[1]

P. L. Poulos and J. W. Heuberger

The concept that the fruit rot phase of the brown rot disease (Monilinia fructicola) of peaches is related to insect and/or mechanical wounds is not new.

In 1910, Scott and Ayers (4) observed in an experimental orchard that 93 percent of the brown rot on fruit originated at curculio punctures. The following year, Norton (1) stated that the brown rot organism enters chiefly through the punctures made by insects. It was not until 1927, however, that Snapp, et al,. (5) published data, covering four years, on experiments for the control of the plum curculio, brown rot, and scab which showed that the incidence of brown rot was related directly to the amount of curculio injury to the fruit.

Stearns and Heuberger (6), in 1949, scored 1000 tagged peaches at approximately two-week intervals (June 17-August 22) in an orchard at Nassau, Delaware, and found that where almost perfect control of insects was obtained brown rot fruit infection did not exceed 1 percent.

Experimentation and Results

In 1950 and 1951, counts were made on brown-rotted fruit in a Triogem variety orchard at Bridgeville, Delaware, to determine what percentage of the rotted areas surrounded a point of injury. Five hundred fruits, with rot areas one inch in diameter or less, were scored on the tree just prior to harvest. These data are presented in Table 1.

Table 1. Frequency of wounds in brown-rotted areas. Triogem variety. Bridgeville, Delaware. 1950-51.

Condition of Rotted Area	Percentage of Fruit	
	1950	1951
1. No visible injury	9.1	2.7
2. Wound in center of rotted area	90.9	97.3

Since the 1950 data indicated that most of the brown rot observed gained its start at a point of injury, an experiment was conducted the following year to determine the relation of insecticide applications to brown rot control. This experiment was conducted in an abandoned orchard of the Elberta variety located at Wyoming, Delaware. The treatments used were Delaware's standard peach fungicide schedule, applied alone and in combination with Delaware's standard peach insecticide schedule to both blocks that had and had not received blossom sprays for control of the blossom blight phase of the brown rot disease. The orchard was divided into 12 blocks consisting of 16 trees each. Insecticides and fungicides, concentrations, and dates of application are listed in Table 2 and are those recommended in "Delaware's Fruit Spray Schedules for 1951" (7).

The last spray application was made on August 2 since three years' data presented by Poulos and Heuberger (2, 3) showed that pre-harvest sprays were not effective in controlling brown rot on late-maturing varieties, such as Elberta, in Delaware.

Blossom blight data were taken at shuck-split by scoring 200 blossoms, 100 in the lower half and 100 in the upper half, on each of four central trees in each block. Where blossom sprays had been applied there was less than 1 percent blossom blight; without blossom sprays 10 percent blossom blight was present.

Fruit rot control data were taken August 15, 20, and 24. The method of scoring the incidence of brown rot was to count all the peaches on each of the four central trees in every block. When a brown-rotted peach was scored, it was knocked from the tree so that it would not be scored again at the next recording date. These data are presented in Table 3.

The data presented in Table 3 show that there was a statistically significant decrease in fruit infection at the 5 percent level where insecticides were included with the fungicides. However, there was no significant difference between the complete fungicide schedule and a schedule where the blossom sprays were omitted.

[1]Published as Miscellaneous Paper No. 148 with the approval of the Director of the Delaware Agricultural Experiment Station. Contribution No. 46 of the Department of Plant Pathology.

Table 2. Spray applications, time of application, and concentrations of the fungicides and insecticides used on peaches, Elberta variety, Wyoming, Delaware, 1951.

Spray application	Date of application	Fungicide (lbs.-100 gals.)	Insecticide (lbs.-100 gals.)
10% bloom	4-5-51	Mag. 70 (8 lbs.)[a]	- - -
30-40% bloom	4-8-51	"	- - -
60-100% bloom	4-11-51	"	- - -
Petal-fall	4-19-51	"	- - -
Post petal-fall	4-24-51	Mag. 70 (4 lbs.)	Parathion, 15% (1 3/4 lbs.)
Shuck-split	5-5-51	"	"
Post shuck-split	5-10-51	Kopper's Flotation[b] (8 lbs.)	"
First cover	5-17-51	Kopper's Flotation (6 lbs.)	"
Second cover	6-1-51	Mag. 70 (4 lbs.)	- - -
Third cover	6-18-51	Kopper's Flotation (6 lbs.)	Parathion, 15% (1 3/4 lbs.)
Fourth cover[d]	7-6-51	Sulforon X (5 lbs.)[c]	DDT, 50W + Parathion, 15% (2 lbs. + 1 3/4 lbs.)
Fifth cover[d]	7-19-51	"	"
Sixth cover[d]	8-2-51	"	"

[a]Stauffer's Magnetic 70 Paste-type Sulfur.
[b]Kopper's Flotation-type Sulfur.
[c]duPont, Wettable sulfur.
[d]These are the additional sprays indicated (7) to maintain sulfur deposits on late maturing varieties such as Halehaven and Elberta.

Table 3. Relative effectiveness of fungicide vs. fungicide + insecticide for control of the brown rot disease of peach, Elberta variety, Wyoming, Delaware, 1951.

Treatment	Percentage fruit infection		Mean
	Complete schedule	Complete schedule excepting blossom sprays	
Fungicide	16.8	14.1	15.4
Fungicide + Insecticide	6.8	8.2	7.5
LSD @ 5%			6.9

Summation

The data presented indicate that the use of effective insecticides, in conjunction with the regular fungicide schedule, aids significantly in controlling the fruit rot phase of the brown rot disease of peaches.

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DELAWARE AGRICULTURAL EXPERIMENT STATION, DEPARTMENT OF PLANT PATHOLOGY

SOIL FUMIGATION TO CONTROL ROOT-LESION NEMATODE, PRATYLENCHUS SP., IN TUBEROUS BEGONIA

M. W. Allen and D. J. Raski

Root-lesion nematodes, Pratylenchus sp., have not been previously reported as parasitic on tuberous begonia. In the fall of 1950 samples of tuberous begonia plants were received from Dr. C. M. Tompkins, Associate Plant Pathologist, University of California, for examination for possible nematode infection. The tubers and roots of these plants were found to be heavily infected by a Pratylenchus sp. This undescribed species is also known as a pest of strawberry, Croft lily, and apple in California. A subsequent survey revealed that the infestation involved a considerable portion of the planting from which the original samples were collected. Previously, in about 1945, the grower had noted symptoms of poor growth in a small area of the planting and had treated the soil with chloropicrin with satisfactory results. However, the continued culture of tuberous begonia on the same area appeared to have resulted in spreading the nematode over a large portion of the planting area. In 1950 there was almost complete failure of the crop on approximately four acres.

Symptoms: The symptoms exhibited by plants infected with root-lesion nematode consisted of poor growth, extensive root disintegration and rot, and the presence of necrotic areas of varying size in the tubers. Late in the growing season it was observed that there was considerable reduction in the number of plants per bed as the result of the severe infections that developed. There was a marked tendency for infected plants to have sparse foliage with reduced numbers of flowers. It was also noted that infected plants lost their foliage several weeks prior to plants that were not infected or only lightly infected.

Treatments: During the winter of 1950-51 soil samples and root samples were examined from the greenhouse in which the plants to be used for the 1951 planting were being grown to seedling stage. These samples were all negative for Pratylenchus sp., indicating that the source of root-lesion nematode infection was the soil into which the seedlings were transplanted in the field. Accordingly, it was recommended that the grower fumigate the field soil with a nematocide prior to planting the new crop. The grower applied Shell DD to the nematode-infested area at the rate of 400 pounds per acre. Several beds were left untreated so that an experimental plot could be established to study the efficacy of different rates of application and different materials in controlling the root-lesion nematode. The plants were grown in the field under lath so that it was not possible to completely randomize the experimental treatments. Also, because of the high per acre value of the crop, the experimental plot was limited to a size that would not interfere with the necessary normal cultural operations.

There were eight plant beds, each 12 feet by 100 feet, in the experimental area. In addition, to avoid the necessity of including Shell DD at 400 pounds per acre in the experimental area, three adjacent commercially treated beds were examined to obtain data on the effectiveness of this treatment.

Shell DD and CBP-55 (chlorobromopropene) were applied to the soil by means of a chisel type applicator. The fumigants were applied to a depth of 8 inches with the chisels spaced 12 inches apart. The air temperature was 64°F., soil temperature 56°F., and the soil moisture 7.7 percent at the time of treatment. The soil in the experimental area was a light sandy loam. Treatments were made on April 17, 1951, and consisted of three untreated beds, three beds treated with CBP-55 at 200 pounds per acre, two beds at 400 pounds per acre, and one bed at 600 pounds per acre. Three beds were treated with DD at 400 pounds per acre and one at 600 pounds. Seedling tuberous begonias grown from seed in nematode-free greenhouse soil were planted in the experimental beds during May 1951. In December 1951 50 plants were dug at random in each of the beds. The roots of these plants were removed from the tubers, chopped and thoroughly mixed. Two 10-gram root samples were taken from each of the lots from each bed. These samples were placed in nematode extraction funnels and the number of Pratylenchus recovered from the roots recorded. Counts were made bi-weekly for a period of three weeks. In addition each tuber was weighed and then examined by removing the outer cortex. Microscopic examination was made of sections of tissue that showed evidence of discoloration or necrosis. The results of these examinations are shown in Table 1.

Discussion: All of the treatments materially reduced the nematode population as is evidenced by the number of nematodes present per gram of root at the end of the growing season. There also appears to have been a significant increase in the average weight of the tubers grown in the treated soil. The amount of tuber rot was considerably reduced as the result of fumigation. However, because of the fact that the tubers were grown for sale, the reduction in the nematode infection is not

Table 1. The effect of fumigation on infection of begonia tubers by Pratylenchus sp., amount of tuber rot due to the nematodes, tuber weight, and number of nematodes per gram of root.

Treatment	Number of tubers	Percent infected	Number rotted	Average wt. grams	Av. no. Pratylenchus sp. per gm. root
None	150	88	116	15.7	225
DD-400	150	29	21	31.5	49
DD-600	50	42	8	37.8	76
CBP 200	150	29	31	27.0	20.2
CBP 400	100	27	14	34.8	19
CBP 600	50	24	7	23.0	37

considered to be adequate. In situations where nursery beds are fumigated for the control of nematodes, the degree of control must necessarily approach 100 percent before it can be considered practical from a quarantine standpoint. These experiments demonstrate that although entirely satisfactory improvement in plant growth can be obtained by fumigation, the marketable crop may carry a fairly high percentage of nematode infection. The begonia tubers grown on the treated soil in this instance would undoubtedly be a source of nematode infestation when planted in new localities.

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SURFACE STERILIZATION OF POPLAR CUTTINGS

Alma M. Waterman and Kenneth F. Aldrich

Increased interest in the breeding of poplars during the past few years has resulted in the demand for exchange or distribution of cuttings for experimental breeding purposes or for nursery plantings, not only throughout the United States, but also to and from Europe, and to South America. Trees selected for desirable qualities of growth have proved in many cases to be highly susceptible to diseases, such as the canker of exotic and hybrid poplars, caused by Septoria musiva, in the United States (6), Canada (1), and Argentina (5); the leaf blotch of exotic and hybrid poplars, caused by Septotinia populiperda, in the United States (7), Holland[1], Germany[1], and Latvia (7); the canker caused by Dothichiza populea (Chondroplea populea) that is widespread in the United States (3) and Europe (2); and the bacterial canker that is widespread and serious in Europe (4), but is not known in the United States. The possibility and danger of spreading these and similar parasitic fungi and bacteria by the presence of spores on dormant cuttings was brought to the attention of the European International Poplar Commission at its meeting in London, England, in May 1951, by a report submitted by G. F. Gravatt[2]. At Mr. Gravatt's suggestion the writer began a series of experiments in January 1951 to determine whether the sterilization of dormant cuttings by dipping in fungicidal solutions would prevent the germination of spores of parasitic fungi that might be embedded in the resinous coating of uninfected buds or lying free in the lenticels. Examination of a number of healthy buds on poplar cuttings has shown that spores of Septotinia populiperda and Septoria musiva may remain viable for some time on the resinous bud scales and might therefore be the cause of infection in newly established plantings. Septoria musiva spores frequently infect through lenticels, and viable spores of this fungus have been found in the lenticular tissue. In Great Britain and the United States cuttings have been treated, before transmittal or upon receipt, with solutions of mercuric chloride[3], but no tests have been made to prove the efficacy of the treatments. Since the period during which such experiments can be carried on is limited to the period of the dormancy of the cuttings, preliminary tests only have been completed during the dormant seasons of 1951 and 1952 and are reported at this time. The results, however, may prove of value to those who are interested in the inter-state or inter-continent shipment of cuttings.

Methods of Experimentation

Cuttings free from visible infection were obtained from plantings of hybrid poplar clones at Cheshire, Connecticut, and at Beltsville, Maryland, in which the Septoria canker and the Septotinia leaf blotch are common or occasional. They were selected from 15 or 16 clones that represent several parentage crosses and that had shown varying degrees of susceptibility to these diseases. These clones are resistant to the species of Melampsora that are common on poplar leaves in the United States and therefore the effect of the treatments on spores of these fungi was not tested. Hot water, mercuric chloride ($HgCl_2$), Clorox containing 5.25% sodium hypochlorite (NaOCl), and Bordeaux mixture were selected for the experiments, because they have been used commonly for surface sterilization or as fungicides.

In the tests with hot water, 4 cuttings of each of 5 clones were dipped at the following constant temperatures and time periods: 50°C., 60°C., and 70°C. for 10 minutes; 40°C., 50°C., 60°C., and 70°C. for 20 minutes. One-half inch was cut from each of the cuttings before planting in sand in the greenhouse. All cuttings treated at 40° produced normal shoots and roots. Of the 20 cuttings treated at 50° for 10 minutes, 6 died; of those treated at 50° for 20 minutes, 16 died; all cuttings treated at 60° and 70° died. Since 50°C., which would be fungicidal, was lethal to some of the clones, it was not considered advisable to continue tests with the hot water.

To test the effect of mercuric chloride on spores of parasitic fungi, two cuttings from a tree

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[1]A collection of leaf blotch was made by G. F. Gravatt in Holland in July 1950. In Germany the disease is reported by H. Johannes in Ein Pappelsterben, hervorgerufen durch den Pilz Septogloeum populiperdum sp. n. Nachrichtenblatt deutschen Pflanzenschutzdienst 2(5): 67-69. 1950.

[2]A quotation from the report was published by Rene Rol in Les peupliers et les principales essences forestières de L'Est des États-Unis. Ann. de Ecole Nat. Eaux et For. 12: 598. 1951.

[3]Information obtained from correspondence with T. R. Peace, Forest Research Station, Surrey, England, who reported the use of 0.1% mercuric chloride in aqueous solution; and from E. J. Schreiner, U. S. Forest Service, Upper Darby, Pa., who has used a saturated solution of mercuric chloride in 70% alcohol, rinsing in running water.

known to have been infected with the Septotinia were sprayed with a suspension of mixed spores of Septoria musiva and Dothichiza populea, then wrapped in waxed paper, left at room temperature for 24 hours, and thereafter stored in a refrigerator at 40°F. After three days, two of the buds were removed from the cuttings, cleared in 5% potassium hydroxide, and examined under the microscope. Germinating spores of all three fungi were present in the resinous coating of the bud scales, indicating that by surface spraying, it was possible to duplicate conditions that might occur in nature. Four of the remaining buds were removed from the stems, dipped in a 0.1% solution of mercuric chloride in 70% alcohol, rinsed in water and placed on malt agar in a petri dish. Four buds were similarly treated, but not rinsed in water. Spores of Septoria and Dothichiza, if present on the buds, failed to develop hyphae, but mycelium characteristic of Septotinia was obtained. This indicated that spores that would remain viable in the resinous coating of the buds might be difficult to eliminate by surface sterilization.

Dormant cuttings were dipped in mercuric chloride at concentrations of 0.1% and 5% (saturated) in 70% alcohol. The resinous coating of the buds is soluble in alcohol and therefore would be at least partially removed from the bud scales. In three tests, the cuttings were rinsed in running water following dipping. In tests with commercial Clorox, dilutions of 10%, 25%, and 50% in water were used. Bordeaux mixture in the proportion 4-4-50 was used alone, or with the addition of 0.1% casein. Details concerning length of time of dipping and concentrations of solutions are given in Table 1.

Two cuttings of each of 15 clones were sprayed thoroughly with a water suspension of mixed spores of the species of Septoria, Septotinia, and Dothichiza. These cuttings were allowed to become partially dry, then were wrapped in waxed paper and stored at 40°F. for three or four days. The cuttings were then dipped individually in the solution to be tested, wrapped in waxed paper, and re-stored. After a storage period of about one week, two or more buds were selected at random from the cuttings of each clone, removed from the stems by sterile forceps, and deposited on a layer of malt agar in petri dishes. Similarly, from the same cuttings, two or more lenticels with a small amount of surrounding bark were carefully cut from the stems and cultured in petri dishes. Control cultures also were made of buds and lenticels from cuttings sprayed with spores but not dipped in test solutions.

A set of cuttings similar to those cultured were not sprayed with spores but were dipped in the test solutions and re-stored. At the time that the cultures were made, these unsprayed cuttings were planted in sand in the greenhouse to determine the effect of the test solutions on bud and root development. Approximately one-half inch was cut from each end of the cuttings before they were planted. Cuttings from the same clones, but untreated in any way, were planted in the green house as checks.

Results of Experiments

The development of the cuttings subjected to the various treatments is reported in Table 1. These cuttings were obtained in a heavily infected plot at Cheshire, Connecticut, and in many cases were from trees that had been weakened by the diseases during the previous season. Moreover, the cuttings used as checks and those dipped in mercuric chloride were collected very early in the winter after a brief dormant period. Therefore, neither shoot nor root development could be expected to equal that of cuttings from uninfected dormant trees. It is evident that the cuttings made good growth with healthy shoots and roots, except those dipped in 5% mercuric chloride 5 minutes, not rinsed, and stored before planting. In order to test more carefully whether this resulted from the condition of the cuttings or from the effect of the residual mercury, cuttings from plots at Beltsville, Maryland, from trees on which infection was occasional or rare, were sprayed with a water suspension of spores and tested in selected solutions, as indicated in Table 2. The cuttings were planted in the greenhouse on the day following dipping, and cultures of buds and lenticels were made at the same time. Cuttings from 16 clones were used in this experiment, 11 of which had not been tested previously. A retarding of growth occurred in cuttings of one clone dipped 5 minutes. Before planting, one-half inch was cut from the ends of each cutting and the stem tissue was green and healthy at this time. However, a similar set of cuttings, dipped and stored in the refrigerator for 2 weeks, showed a blackening of the cambium at each end, particularly in those cuttings dipped 5 minutes. Untreated cuttings were discolored only on the surface of the cut. Measurements of the discolored areas, at each end of 32 cuttings in each dip, are given in Table 3. This indicates that, in cuttings dipped 2 minutes or 5 minutes and stored, the toxic effect of the mercuric chloride may extend beyond the one-half inch cut recommended.

Records were made of all fungi that developed from each bud and lenticel cultured. Fungi other than the species of Septoria, Septotinia and Dothichiza were considered to be saprophytes and

Table 1. Effect of treatments on growth of poplar cuttings[a] and on development of fungi from buds and lenticels.

Treatment	Cuttings		Buds and lenticels		Effect on spores of parasitic fungi[c]
	Planted	Growth good	Cultured	Sterile[b]	
	Number	Number	Number	Percent	
No treatment	38	37	56	0	
Clorox					
4-second dip, not rinsed					
10% in water	25	24	116	7	Poor
25% in water	30	28	108	17	Poor
50% in water	30	29	116	15	Poor
Bordeaux, 4-4-50					
6-second dip, not rinsed	27	25	116	0	Poor
Bordeaux, 4-4-50					
0.1% casein added					
6-second dip, not rinsed	30	28	64	0	Poor
Bordeaux, 4-4-50					
0.1% casein added:					
6-second dip in					
70% alcohol, rinsed;					
6-second dip in					
Bordeaux, not rinsed	78	71	173	0	Poor
Mercuric chloride in					
70% alcohol					
0.1% solution					
4-second dip, rinsed	20	20	70	0	Poor
5% solution					
4-second dip, rinsed	32	32	181	37	Poor
5-minute dip, rinsed	45	41	116	57	Good
4-second dip, not rinsed	30	25	120	83	Excellent
5-minute dip, not rinsed	30	15	117	78	Excellent

[a] Data taken at end of 4 weeks of growth.
[b] "Sterile" indicates no isolations of parasitic or sparophytic fungi.
[c] "Poor" indicates more than two isolations of parasitic fungi; "good" indicates one or two isolations; "excellent" no isolations.

no attempt was made to identify them. However, their presence or absence indicated whether the solutions would be effective in obtaining satisfactory surface sterilization. In all tests these fungi were isolated from some of the buds and lenticels and complete sterilization was not obtained. In Tables 1 and 2, the percentage of sterile buds and lenticels from which no parasitic or saprophytic fungi were isolated is listed. The abundance and rapidity of growth of the saprophytic fungi seemed to hinder the isolation of the three parasitic fungi. Colonies typical of Dothichiza populea did not appear in any of the cultures. Septoria musiva is characteristically difficult to isolate if secondary fungi of more rapid growth are present, and therefore its occurrence in culture was rare. Septotinia populiperda, however, is more readily germinable and rapidly produces a characteristic mycelial growth. The isolation of this fungus was especially important in estimating the value of the treatments. A species of Phomopsis was commonly isolated from the buds and lenticels of the cuttings reported in Table 1. This fungus occurs abundantly on cankers that result

Table 2. Effect of treatment with mercuric chloride solution on the growth of poplar cuttings[a] and on the development of fungi from buds and lenticels.

Treatment	Cuttings		Buds and lenticels		Effect on spores of parasitic fungi[c]
	Planted	Growth good	Cultured	Sterile[b]	
	Number	Number	Number	Percent	
No treatment	80	80	64	0	
5% mercuric chloride in 70% alcohol					
4-second dip, not rinsed	64	64	64	83	Excellent
2-minute dip, not rinsed	64	64	64	87	Excellent
5-minute dip, not rinsed	64	62	64	92	Excellent

[a] Cuttings from 16 clones from plots at Beltsville, Md.; 11 of these clones not tested previously. Data taken after 19 days of growth.
[b] "Sterile" indicates no isolations of parasitic or saprophytic fungi.
[c] "Poor" indicates more than two isolations of parasitic fungi; "good" indicates one or two isolations; "excellent" no isolations.

Table 3. Effect of mercuric chloride on ends of cuttings.

Length of dip	Extent of discoloration, 64 cut ends			
	2-5 mm.	6-9 mm.	10-13 mm.	over 13 mm.
	Percentage			
4 seconds	100			
2 minutes	50	36	12	2
5 minutes	17	49	25	9

from infection by Septoria musiva and its presence in culture was considered as partially indicative of the effect of the treatments. The total absence of isolations of the three parasitic fungi from buds or lenticels was considered an indication of the excellent effect of the treatment. The various treatments in Tables 1 and 2 are rated as poor if more than 2 isolations of the parasitic fungi were obtained, and excellent if no such isolations occurred.

The greatest decrease in growth of fungi both parasitic and saprophytic, occurred from the use of the mercuric chloride, particularly when the cuttings were not rinsed in water after dipping. The 4-second, 2-minute, and 5-minute dips are equally effective in preventing the growth of spores of the parasitic fungi. A slight retarding of root growth may result from the residual mercury on non-rinsed cuttings dipped 2 minutes or 5 minutes. The 4-second non-rinsed treatment, therefore, is preferable and satisfactory. While the Clorox seemed to cause a slight decrease in the fungus growth from the lenticels, it had no sterilizing effect on the buds, possibly because of the insolubility of the resinous coating of the buds in aqueous solution. However, when the cuttings were dipped in 70% alcohol and then in 4-4-50 Bordeaux, the fungus spores were not affected sufficiently to prevent germination. In this connection it was found that, although the resin on the bud scales was noticeably dissolved by the alcohol, it was apparently renewed by the buds during storage. The buds, therefore, are not injured by the alcohol so long as they are dormant. If they are dipped after they have opened sufficiently to show green above the bud scales, the alcohol will kill the marginal tissue of the first-developing leaves.

At present no treatment has given absolute sterilization and further tests with other chemicals, such as some of the organic fungicides, will be necessary to determine whether complete sterilization can be obtained without injury to the cuttings. The following treatment had no toxic effect on cuttings planted in the greenhouse, and will give satisfactory control of spores of three leaf-

and stem-infecting fungi that may remain viable in the resinous coating of healthy buds or in lenticels: Dip dormant cuttings individually 4 or 5 seconds in a 5% (saturated) solution of mercuric chloride in 70% alcohol; do not rinse. Ship the cuttings immediately or store them at a low temperature. Before planting, cut one-half inch from each end of the cuttings. If you plant the cuttings out-of-doors, watch them carefully for two years to detect any leaf or stem infection. This treatment would have little or no toxic effect on infection, caused by Septoria musiva or Dothichiza populea, in small lesions on the cuttings.

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WHAT'S NEW IN PLANT PATHOLOGY[1]

W. B. Tisdale

During the last decade, many new plant diseases, or old ones which heretofore were of minor importance, have come into prominence. Concurrently with this, many new materials and methods for their control have been developed. Such developments have been so numerous in some States that the plant pathologists have been hard pressed to keep up with their own problems, to say nothing of the problems in other States.

This must have been the situation the program committee had in mind when they suggested the paper entitled "What's New in Plant Pathology." On first thought, this assignment seemed fairly simple and easy, but when information began to arrive from plant pathologists in the southern States, it was soon found that all of the new information could not be reviewed in ten minutes. Consequently, an effort has been made to include as much as possible of the new developments in the allotted time and leave decision about relative importance to the individual. The diseases considered fall in groups to some extent.

Tree Diseases

Oak wilt (Chalara quercina) has been known in the Lake States for more than a decade. During that time it has been spreading at a comparatively rapid rate in several directions. In 1951 it was found in a number of the southern States, including North Carolina, Tennessee, Virginia, and Kentucky, where all species of oaks appear susceptible.

Elm phloem necrosis (virus) is another destructive tree disease that is now known to be present as far south as Chattanooga, Tennessee and vicinity.

Flower spot of dogwood has been noticeable in Georgia for the past four years, and it is apparently spreading rapidly. During that period it has increased in intensity in Atlanta and some other north Georgia cities, but its distribution is not known.

Xyloporosis, a disease of citrus trees budded on sweet lime rootstock, was observed in Florida for the first time. Because the sweet lemon is not a commonly used rootstock in Florida, incidence of the disease is not considered of major importance.

Field Crops

Barley scald (Rhynchosporium secalis), previously confused with "winter kill", caused considerable damage to barley in Tennessee in the last three years. A method for testing comparative resistance of breeding lines has been found which greatly increases the probability of the disease developing in test plots in the field. Using this method, several highly resistant lines have been found and crosses have been made with these the same season.

A new winter oat variety, Arkwin, has been released in Arkansas. This is resistant to most serious strains of rust and smut and to Helminthosporium blight, and is high yielding.

Helminthosporium victoriae occurred in epidemic form in Georgia in the fall and winter of 1946-48, but since then it has been observed in serious form only in a few isolated fields. Southland, a new variety of oats, resistant to H. victoriae and crown rust, is finding favor in this area.

Losses from Verticillium wilt (V. albo-atrum) of cotton in Arkansas have been found to be closely correlated with rainfall and temperature.

In 1951 incidence of Verticillium wilt of cotton was highest on high-fertilizer plots and lowest on low-fertilizer plots.

Helminthosporium turcicum is causing severe damage to sweet corn in the southern part of Florida. A satisfactory means of control has not yet been found.

Ergotism (Claviceps purpurea) of cattle has become a serious potential hazard for a few weeks at the end of the summer rainy season, owing to widespread planting of the very susceptible Argentine strain of Bahia grass.

Black shank (Phytophthora parasitica var. nicotianae) of tobacco has spread at an alarming rate in Kentucky and Virginia. The only control now available is the use of resistant varieties, and only a few of such varieties produce the desired quality. Work is in progress to incorporate in one variety resistance to all principal diseases.

[1] Paper read at the general assembly of the Association of Southern Agricultural Workers, Atlanta, Georgia, February 4, 1952. (Read by Phares Decker for Dr. Tisdale)

Nematodes

Root-knot nematode (Meloidogyne) has been reported to be causing considerable damage to peanuts in certain areas of Georgia and Virginia and to some extent in other southern States. Breeding for resistant strains and soil fumigation are being studied as means of control.

Other kinds of nematodes have been found associated with root injury of several crop plants in Florida and other southern States. These nematodes are known to feed on native grasses and probably other monocotyledonous wild plants, as well as crop plants.

The stubby-root nematode, Trichodorus sp., has been found in several areas of Florida, but not in the marl and muck soils. It feeds almost exclusively at the root tips and devitalizes them without causing much necrosis. Such injury finally results in root systems composed of stubby, short rootlets. Of cultivated crops tested corn, celery, beets, and English peas are most severely damaged.

The sting nematode, Belonoclaimus gracilis, is known to occur in several sections of Florida but has not been found in the muck or marl soils. It has also been reported to cause injury to peanuts in Virginia. This nematode feeds at the root tips and along the side of small rootlets, only rarely entering the root tissue. The end result is similar to that caused by stubby-root, except that there is more necrosis. Celery, corn, beans, strawberries, peanuts, and probably peppers are seriously affected.

The awl nematode, Dolichodorus heterocephalus, is similar in appearance and in feeding habits to the sting nematode and has about the same effect on the roots of plants. Celery and corn are the principal crops known to be affected. The Sanford area, on the East coast, is the only place it is known to occur in Florida.

Seed Treatments

Treatment of cotton seed and peanuts before planting is in general use. The estimate of treated cotton seed is from 50 to 75 percent of the total planted.

In Arkansas, Panogen, Agrono, and Agrox used as seed treatments have proved as effective as Ceresan M for controlling seedling blight of rice.

White-tip of rice (a seed-borne nematode disease) has been significantly reduced by seed treatment with organic phosphate insecticides and by methyl bromide fumigation.

Vegetable Crops

Diseased seed and infected transplants imported from other States are the principal sources of black rot of crucifers in the Hastings area of Florida. The black rot organism (Xanthomonas campestris) lives in the soil of that area one year but not two.

Cabbage yellows (Fusarium oxysporum f. conglutinans) was introduced into the Hastings area of Florida in 1948 in cabbage seedlings from Virginia and other States and has spread to many fields throughout the area. Because of this about half of the 7000 acres was planted in the 1951-52 season to the yellows-resistant varieties, Marion Market, Medium Copenhagen Resistant, and Resistant Glory. Previous tests showed that these varieties produce satisfactory yields and quality.

Club-root (Plasmodiophora brassicae) of crucifers was found for the first time in Florida in 1951.

A damping-off and rootrot of celery in the Sanford area of Florida, previously considered to be caused by conditions of soil and fertilizer, have been found to be caused by Rhizoctonia and certain other soil inhabiting fungi.

Incidence and importance of late blight (Phytophthora infestans) of potatoes and tomatoes, although at times severe, has varied widely from year to year. Mildew of cucurbits, both downy (Pseudoperonospora cubensis) and powdery (Erysiphe cichoracearum), has required control measures. Zineb and nabam plus zinc sulfate, timely applied according to the parasite-host relationship, with improved spraying and dusting equipment, have given adequate field control of these diseases. Spergon has proved best for downy mildew of crucifers, especially in seed beds.

Timeliness and method of application of fungicides have proved as important as the material used under Florida conditions.

Resistance to Phomopsis blight (P. vexans) has been incorporated in two new varieties of eggplant, Florida Market and Florida Beauty. These varieties are rapidly replacing susceptible varieties in the South. Emerson Pascal celery resistant to early blight (Cercospora apii) and the Contendor and Wade varieties of green bean resistant to mosaic (virus) show great promise in Florida.

Sclerotiniose (Sclerotinia sclerotiorum) of vegetable crops varies in importance from year to year on the East coast of Florida, but it is a serious threat because no satisfactory method of control has been developed for that area.

Virus Diseases

The virus disease of sweet potato known as internal cork has become widespread since 1944, especially in Georgia, so that it is now almost impossible to find any farm in Georgia that is not affected. So far no satisfactory means of control has been found.

A virus disease of yellow lupine reported from Florida may materially reduce the green weight and seed yield of this winter cover crop.

Virus diseases have recently been serious on peppers in certain parts of the South, and present indications are that several distinct diseases are involved. A new virus disease of cantaloup was recently reported from South Carolina, and a similar but not identical one is common in central Florida, where it occurred on cucurbits more commonly than cucumber mosaic in most areas.

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NEW OR UNUSUAL RECORDS OF PLANT DISEASES

WHITE RUST OF SPINACH IN LOUISIANA

By A. G. Plakidas

White rust (Albugo occidentalis) was observed in a planting of several acres of spinach near Natchitoches, Louisiana by Dr. W. J. Martin on April 4, 1952. The disease was widespread in this planting and quite severe causing the typical yellowing of the leaves.

Other spinach plantings in other localities, Chennyville, Baton Rouge, and LaPlace, were examined by Dr. Martin earlier in the season, and no white rust was found in them.

As far as our records show, this is the first occurrence of white rust on spinach in Louisiana.

LOUISIANA AGRICULTURAL EXPERIMENT STATION, BATON ROUGE, LOUISIANA

DOWNY MILDEW OF SNAPDRAGON FOUND IN MARYLAND

By W. F. Jeffers

FIGURE 1. Downy mildew of snapdragon.

On February 18, 1952, Dr. E. N. Cory, Maryland State Entomologist, collected specimens of a snapdragon disease which he sent to the author for diagnosis. The under surface of several leaves was covered by a bluish-purple, downy fungus growth typical of one of the downy mildews (Figure 1). Conidiophores and conidia were typical of the genus Peronospora.

According to the records of the Division of Mycology and Disease Survey, United States Bureau of Plant Industry, Soils, and Agricultural Engineering, Peronospora antirrhini Schroet. was first reported in the United States by Harris in 1939[1]. This report was from California, and later this organism was reported from Oregon, Oklahoma and Pennsylvania. Thus the present finding constitutes the fifth State in which downy mildew of snapdragon has been reported. However, unofficial information indicates that the disease may not be too uncommon.

This infection occurred in a greenhouse of a commercial florist and caused serious damage in most of the planting. However, no infection was observed in adjoining sections also containing snapdragons. The grower had made several applications of ferbam but had obtained little or no control. The material was not properly applied and little fungicide reached the lower leaf surfaces. Later a new sprayer was used and zineb was applied carefully, and is said by the grower to have given fairly good control.

PLANT PATHOLOGY DIVISION, UNIVERSITY OF MARYLAND, COLLEGE PARK, MARYLAND

[1]Harris, M. R. Downy mildew on snapdragon in California. Plant Dis. Reptr. 23: 16. 1939.

PHYTOPHTHORA ROOT ROT OF NURSERY STOCK

By George A. Zentmyer and Donald E. Munnecke

During the summer and fall of 1951, and spring of 1952, Phytophthora cinnamomi Rands was found causing a root rot, and in one case also a crown rot, of a number of ornamental plants in southern California nursery. P. cinnamomi was isolated from the following plants: camellia (Camellia japonica), heather (Erica regerminans), deodar (Cedrus deodara), an ornamental variety of Lawson cypress (Chamaecyparis lawsoniana var. elwoodi), two species of pine (Pinus radiata and P. canariensis), incense cedar (Libocedrus decurrens), a variety of Italian cypress (Cupressus sempervirens glauca), an arbor vitae (Thuja compacta), and myrtle (Myrtus compacta). Plants infected were young cuttings or seedlings, growing either in two- or three-inch pots. In all

cases a brown discoloration and rotting of small roots occurred; this was reflected in either a yellowish-green color of the leaves and lack of new growth, or a wilting and death of the top, depending on the severity of the root attack. With heather the crowns of the plants were also invaded and severe dieback of the tops followed.

Deodar, incense cedar, Italian cypress, arbor vitae, and myrtle are new hosts for Phytophthora cinnamomi; this is the first report of this fungus on camellia, pine and ornamental Lawson cypress in California. Gill[1] first described this pathogen on camellia in Alabama in 1948. Torgeson[2] recorded the occurrence of P. cinnamomi on Chamaecyparis lawsoniana nursery stock in Oregon in 1951. Jackson and Crandall[3] described P. cinnamomi on Pinus resinosa seedlings in the eastern United States in 1935.

Severe losses occurred particularly in the camellia beds, with several thousand plants affected. Several varieties were diseased; Covina was one of the most severely attacked. P. cinnamomi was isolated from soil beneath the nursery lathhouse beds to a depth of nine inches. These were flat beds, with plots placed directly on the ground.

DIVISION OF PLANT PATHOLOGY, UNIVERSITY OF CALIFORNIA, RIVERSIDE AND LOS ANGELES

[1]Gill, D. L. Camellia wilt and root rot. Phytopathology 38: 575-576. 1948.
[2]Torgeson, D. C. The Phytophthora root rots of Chamaecyparis lawsoniana Parl. Phytopathology 41: 944. 1951.
[3]Jackson, L. W. R., and B. S. Crandall. A Phytophthora root and collar rot of Pinus resinosa seedlings. Phytopathology 35: 22. 1935.

BRIEF NOTES ON PLANT DISEASES

WHEAT MOSAIC IN VIRGINIA

By S. B. Fenne and C. W. Roane

Wheat mosaic is widespread in the Piedmont and Tidewater areas of Virginia this year (1952). Previously, the disease has been observed only at the Arlington Experiment Farms where it was first observed on winter rye in 1925[1]. This year, the disease has been observed on individual farms in Buckingham, Essex, and Westmoreland Counties and on several farms in Richmond County, where on at least three farms wheat is following wheat. The symptoms expressed indicate that the mosaic-rosette virus, or wheat virus 1, is the causal agent[2]. Three varieties, Atlas 66, Vahart, and Thorne, are being attacked. Atlas 66 has been severely stunted and mottled; Vahart and Thorne have been only slightly affected. Yields from the fields under observation will not be available until June, three months from now.

This outbreak of mosaic in Virginia is coupled with the introduction in 1950 of the mosaic-susceptible Atlas 50 and Atlas 66 wheats. Previously only mosaic-resistant varieties, such as Forward, Leap, Leapland, V. P. I. 131, Thorne, and Vahart, were widely grown. Apparently the mosaic virus has been present on certain farms since 1950, because two of the farmers on whose farms mosaic is now severe reported that small patches of the disease appeared on their farms in the spring of 1951. If the mosaic virus were present prior to 1950, the mild expression of the symptoms of the disease on the resistant varieties apparently did not attract any attention. If not present prior to 1950, transmission of the virus through seed is suggested.

VIRGINIA AGRICULTURAL EXTENSION SERVICE AND VIRGINIA AGRICULTURAL EXPERIMENT STATION BLACKSBURG, VIRGINIA

[1]McKinney, H. H. A mosaic disease of winter wheat and winter rye. U. S. D. A. Dept. Bull. 1361. 1925.
[2]_____. Mosaic diseases of wheat and related cereals. U. S. D. A. Cir. 442. 1937.

SCALD RESISTANCE IN OLDAMBSTER BARLEY

By C. W. Roane and T. M. Starling

Several reports on the incidence of barley scald, caused by Rhynchosporium secalis, have indicated that it may become a disease of major importance in the northeastern United States. Most of the commercial varieties grown in this area appear to be susceptible to this disease. Few winter-hardy barley varieties have been reported as resistant to scald. The natural occurrence of scald in the barley breeding and disease nursery at Blacksburg has given the writers an opportunity to observe the reactions of a number of winter barley varieties to Rhynchosporium

secalis. Oldambster (C. I. 2491) was highly resistant to scald in 1951 when varieties growing in adjacent rows were severely diseased. Ratings of Oldambster and varieties adjacent to it are given below.

1951 Row Number	Variety	C. I. Number	Scald Percent Severity
1106	Minsturdi	1556	65
1107	Black Russian	2202	40
1108	Oldambster	2491	0
1109	(Unnamed)	3527-2	40

Oldambster was rated as intermediate to scald by Poehlman (Missouri Agr. Expt. Sta. Res. Bull. 442).

DEPARTMENT OF PLANT PATHOLOGY AND PHYSIOLOGY, AND DEPARTMENT OF AGRONOMY, VIRGINIA AGRICULTURAL EXPERIMENT STATION, BLACKSBURG, VIRGINIA

EXPERIMENTAL FORECAST OF WHEAT LEAF RUST IN OKLAHOMA FOR 1952

By H. C. Young, Jr., and D. F. Wadsworth

An extended dry period during August, 1951, prevented the growth of volunteer grain in most sections of Oklahoma. Consequently, there were no local concentrated sources of leaf rust (Puccinia rubigo-vera var. tritici) inoculum for fall-sown wheat, such as there were in the fall of 1950. A very light infection was found over much of the State during a survey made in November, 1951. The distribution of the infections in individual fields and over the State as a whole indicated that most of the inoculum was undoubtedly blown in from more northerly areas.

Pustule counts on Cheyenne wheat, normally susceptible to all races of leaf rust, were made at Stillwater throughout the winter. These counts indicated that the intensity of rust infection increased gradually until January, 1952, when it was temporarily halted by a dry period. Winter temperatures were not severe enough to cause any appreciable reduction in rust intensity in the Stillwater area. With the resumption of rainfall and moisture periods in late February, the rust began to increase again. Pustule counts at Stillwater show a gradual rise from 746 pustules per 1000 tillers on February 1 to 4947 per 1000 tillers on March 31. The latter figure is comparable with that obtained in 1946, but is approximately 16 times the figure obtained for the same date in 1949, 1950, and 1951.

An extended survey through the principal wheat-growing areas of the State on March 27 to 31 indicated that rust survived equally well or better in many areas of the State, whereas in the last few years rust survival has been more limited to the eastern and southern fringes of the wheat belt. Thirty counties were surveyed this year and at least trace amounts of rust were found in all counties except Texas, Cimarron, and Jackson where moisture throughout the winter has been very deficient. More concentrated areas of infection were found in Garvin, Cotton, Tillman, Kiowa, Alfalfa, Woods, and Beaver Counties.

Thus, the 1952 season promises to be one of above average rust development in Oklahoma. With this concentration and distribution of inoculum on April 1 the loss may be expected to be greater than that sustained during the last 5 years. Loss in yield due to leaf rust infection is expected to reach an average of 7 to 10 percent of the crop, which is somewhat above normal for Oklahoma. Rust should develop to a greater extent in the eastern and southern areas of the wheat belt. Late fields and those in low areas will suffer the most damage.

OKLAHOMA AGRICULTURAL AND MECHANICAL COLLEGE, STILLWATER

ATTENTION PLEASE !

CONTRIBUTORS TO THE REPORTER

We repeat the following request concerning illustrations, and announcement about reprints, and a few miscellaneous items, since many contributors apparently have overlooked the previous statements (see PDR 35(2): 121-122. Feb. 15, 1951, for further information).

Please note that:

(1) ILLUSTRATIONS for the Reporter should be sent to us unmounted. A sketch can show a preferred arrangement, although it should be noted that proportions of text and illustrations sometimes make it difficult to follow a set plan. However, we will do our best to comply with an author's suggestions . Please keep page size, shape, and standard reduction in mind (PDR as above) and remember that titles and legends will be part of the page. Drawings, maps, and graphs should be finished, ready for reproduction; not just sketches.

(2) MANUSCRIPTS should be the original typed copy, not carbons, and should always be double-spaced.

(3) Check your LITERATURE REFERENCES carefully. We can not do this for you.

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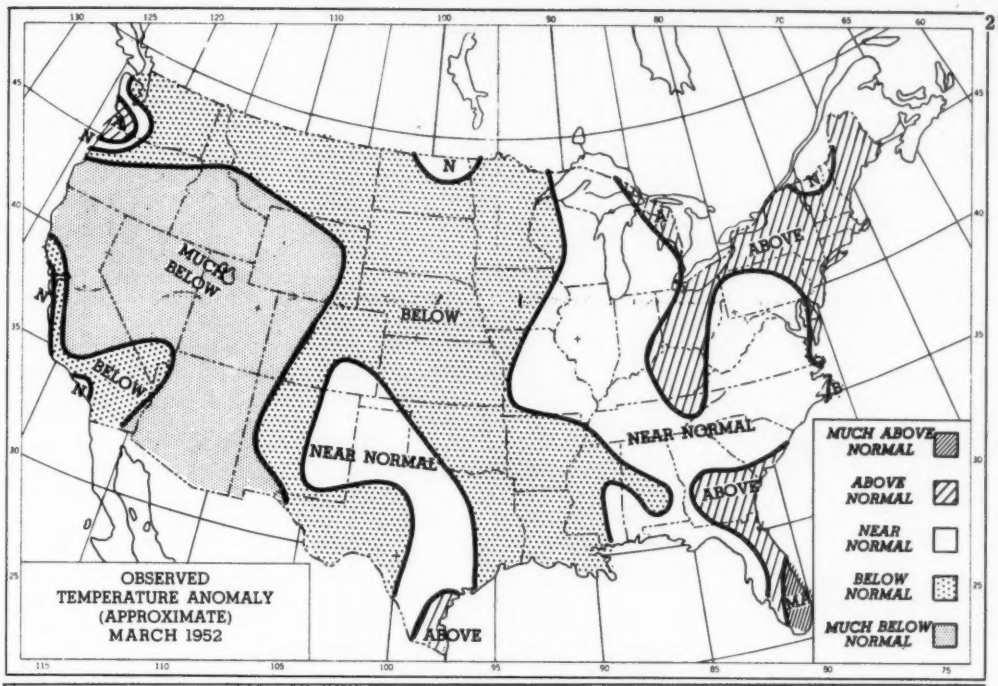

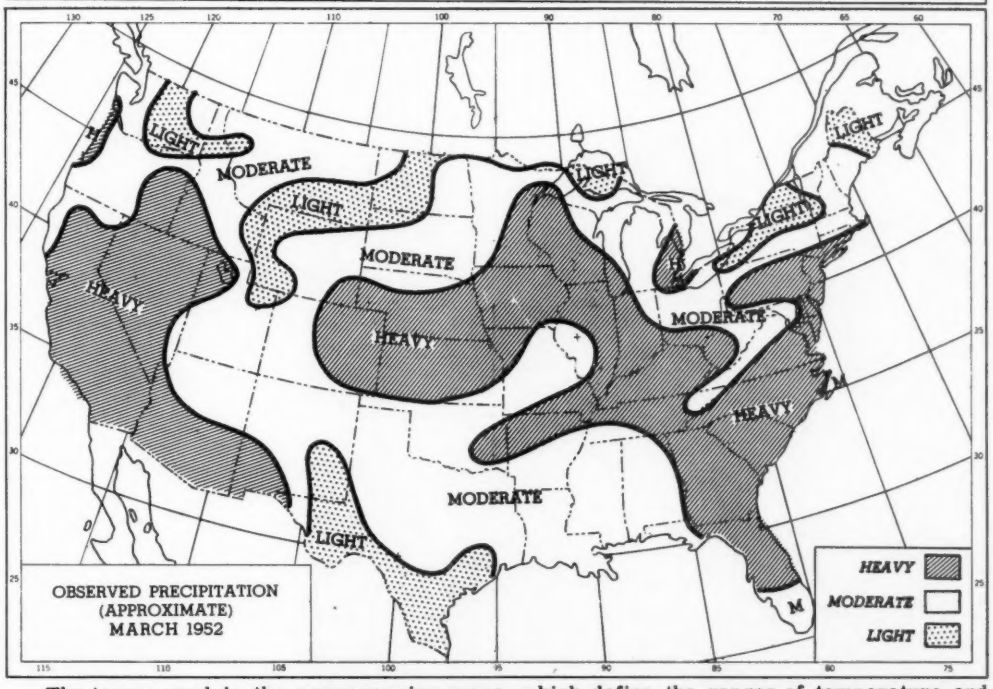

The terms used in the accompanying maps, which define the ranges of temperature and precipitation, are numerical class limits. These are based on a statistical analysis of past records through which is determined the normal frequency of occurrence of temperatures and precipitation at various times of the year for different locations. For temperature the classes above, below, and near normal are so defined that they each normally occur one-fourth of the time; much above and much below normal, one-eighth of the time. Precipitation is depicted in terms of light, moderate, and heavy, each class normally occurring one-third of the time and thereby having equal probability of occurrence. These maps graphically represent only the general trends and give the country's weather picture at a glance. For quantitative studies, where monthly mean temperatures and actual precipitation records are needed for a given time and place, other publications of the Weather Bureau should be consulted. P. R. M.